ISSN 0253-4924

FOOD TECHNOLOGY *Abstracts*

Vol. 29 No. 4 April 1994

Central Food Technological Research Institute, Mysore
National Information System for Science and Technology
Department of Scientific and Industrial Research, New Delhi.

NATIONAL INFORMATION CENTRE FOR FOOD SCIENCE AND TECHNOLOGY

CFTRI, MYSORE - 570 013

The National Information Centre for Food Science and Technology (NICFOS), is a discipline oriented information service in Food Science, Technology and Nutrition. Set up in October 1977 at the Central Food Technological Research Institute (CFTRI), Mysore, it is one of the Sectoral Information Centres under the NISSAT of the Govt. of India, Dept. of Scientific and industrial Research.

NICFOS's services are generated by a band of professional specialists and backed up by reprographic, micrographic, printing and computer facility. Its services include publication of R & D and industry oriented current awarness services, answering technical inquries, reprography and training.

NICFOS BASE

The well-equipped Library of CFTRI with its collection going back to 1950 function as a clearing house for information on all aspects of food area. With its large collection of books, monographs, conference proceedings, bound volumes of periodicals, standards, patents, reports, theses, microforms and 600 current periodicals it can provide you with the latest information on any subject area of food. The library also serves as a training centre in different aspects of information handling and use besides guiding in setting up of new libraries in the area of food science and technology.

PHOTOCOPY (XEROX) OF PUBLISHED SCIENTIFIC/TECHNICAL ARTICLES

The National Information Centre for Food Science and Technology (NICFOS) at the Central Food Technological Research Institute, Mysore, has got a good collection of scientific and other periodicals collected over the years in the area of Biological Sciences. If any article is needed for reference work, we will supply one copy from our wealth of collections. The cost of providing the copies is Rs.2/- per page (minimum charge Rs.10.00). Please take advantage of this facility to overcome your problem in getting original articles.

All correspondences regarding these services should be addressed to:

The Head

FOSTIS, CFTRI,

Mysore 570 013,

Karnataka, India.

FOOD TECHNOLOGY ABSTRACTS

Vol. 29 No. 4
April 1994

National Information Centre For Food Science And Technology
Central Food Technological Research Institute,
Mysore - 570 013, India

Compiled and Edited by

B. Vasu

C. S. Anita

Geetha Seetharam

Abstractors to FTA

AS	Author's Summary
BV	B. Vasu
CSA.	C. S. Anita
GS	Geetha Seetharam
KAR	K. A. Ranganath
SD	S. Dhanaraj
SRA	S. R. Ananthnarayan
VKR	V. Krishnaswamy Rao
RN	R. Naresh

Computerisation and Database Creation

P. Manilal

C. S. Anita

B. Vasu

S. R. Ananthnarayan

Annual Subscription : Rs.300.00. US $ 90.00. Single Copy : Rs.30.00

FOOD
TECHNOLOGY
ABSTRACTS

Vol. 29, No. 4, 1994

CONTENTS

ABBREVIATIONS

A	ampere
AAS	atomic absorption spectrometry
ADP	adenosine diphosphate
Anon.	Anonymous
AOAC	Association of Official Analytical Chemists
approx.	approximately
atm	atmosphere
ATP	adenosine triphosphate
a_w	water activity
BHA	butylated hydroxyanisole
BHT	butylated hydroxytoluene
BOD	biological oxygen demand
b.p.	boiling point
Btu	British thermal unit
c-	centi- [as in cm, cm^2, cm^3]
cal	calorie
cd	candela
°C	degree centigrade
Ci	curie
CMC	carboxymethyl cellulose
COD	chemical oxygen demand
coeff.	coefficient
conc.	concentrated
concn.	concentration
cv.	cultivar
cwt	hundredweight
d-	deci-
DE	dextrose equivalent
detn.	determination
DFD	dark firm dry
diam.	diameter
dil.	dilute
DM	dry matter, Deutsche Mark
DNA	deoxyribonucleic acid(s)
dyn	dyne
E.	East, Eastern, etc
ECD.	electron capture detection
EDTA	ethylenediaminetetraacetic acid
Eh	oxidation-reduction potential
ELISA	enzyme-linked immunosorbent assay
f-	femto-[10^{-15}, as in fCi]
°F	degree Fahrenheit
FAO	Food and Agricultural Organization
FDA	Food and Drug Administration
FID	flame ionization detection
fl oz	fluid ounce
f.p.	freezing point
ft	foot, feet
g	gram
GC	gas chromatography
gr	gravity
gal	gallon
gf	gram-force
GLC	gas-liquid chromatography
h	hour
ha	ectare
HDPE	high density polyethylene
hl	hectolitre [100 l]
hp	horse power
HPLC	high performance/pressure liquid chromatography
HTST	high temperature short time
Hz	hertz [frequency cycles/s]
in	inch
IR	infrared
IU	international unit
J	joule
k-	kilo- [as in kcalk, kg]
K	Kelvin
l	litre
lb	pound
lbf	pound-force
LDPE	low density polyethylene
m-	milli- [as in mg, ml, mm]
m-equiv	milli-equivalent
M	molar concentration
M-	mega- [as in Mrad]
max.	maximum
min	minute [time]
min.	minimum
mol	mole
mol.wt.	molecular weight
m.p.	melting point
MPN	most probable number
MS	mass-spectrometry
n-	nano-[10^{-9}, as in nm]
N	Newton [kg m/s^2]
N.	North, Northern, etc
N	Normal concentration
NMR	nuclear magnetic resonance
NPU	net protein utilization
oz	ounce
p-	pico- [10^{-12}, as in pCi]
P	Poise
p	probability
Pa	pascal (N/M^2)
PAGE	polyacrylamide gel electrophoresis
PER	protein efficiency ratio
p.p.b.	parts per billion
p.p.m.	parts per million
PSE	pale soft exudative
PTFE	polytetrafluorethylene
PVC	polyvinyl chloride
PVDC	polyvinylidene chloride
qt	quart
R	rontgen
rad	rad or radian
ref.	reference(s)
rev/min	revolutions per minute
RH	relative humidity
RNA	ribonucleic acid(s)
S.	South, Southern, etc.
s.d.	standard deviation
SDS	sodium dodecylsulphate
s.e.	standard error
s	second [time]
SNF	solids-not-fat
sp.,spp.	species
sp.gr.	specific gravity
summ.	summary
Suppl.	Supplement
t	metric tonne
temp.	temperature
TLC	thin layer chromatography
TS	total solids
UHT	ultra-high temperature
UV	ultraviolet
V	volt
var.	variety
vol.	volume
v/v	volume/volume
W	watt
W.	West,Western,etc.
WHO	World Health Organization
w/v	weight/volume
wk	week
wt.	weight
yd	yard
yr	year
µ	micro-[as in g, µm]
%	per centum
>	greater than
≥	greater than or equal to; not less than
<	less than
≤	less than or equal to; not greater than

ABBREVIATIONS FOR LANGUAGES

Language of text	
Dutch	Nl
French	Fr
German	De
Italian	It
Japanese	Ja
Norwegian	No
Spanish	Es
Swedish	Sv

GENERAL

604

Garg (N), Tandon (DK) and Kalra (SK). **Utilization of fruit industry waste.** *Beverage and Food World* 21(1); 1994; 16-20, 24

This article covers the utilizable and potentially utilizable waste originating from major fruit (apple, citrus, grape, mango, pineapple) processing industries and their possible/probable utilization. 81 references. SRA

FOOD PROCESSING

605

Srivastav (PP), Das (H) and Prasad (S). **Effect of roasting process variables on hardness of Bengalgram, maize and soybean.** *Journal of Food Science and Technology (India)* 31(1); 1994; 62-65

Bengalgram, maize and soybean grains were roasted at 12 plus or minus 0.5% initial moisture content and 1:4 grain-to-sand ratio at 180, 215 and 250°C sand temp. for 1.5, 2.0 and 2.5 min roasting time, to study the effect on hardness after roasting. Sand temp. was observed to be significant in all the cases. In general, the hardness decreased with roasting time. The optimum conditions for roasting were obtained by the canonical analysis of response surface methodology. AA

FOOD PACKAGING

606

Mahadeviah (M), Gowramma (RV), Naresh (R) and Mahendra Pandian (S). **Influence of some edible corrosion inhibitors to inhibit corrosion in food cans.** *Indian Food Packer* 48(2); 1994; 11-23

Various components of cabbage were separated and their influence on the inhibition of corrosion in tinplate containers by some corrosive fruit and vegetable products studied. Cabbage pulp and fibre were found to give complete protection to cans packed with the highly corrosive vegetable, ivy gourd. Inhibition effect of cabbage powder on tin corrosion by banana puree, pineapple juice, mango juice etc. and efficiency of a few phospholipids in inhibiting corrosion using several corrosive products were studied. These compounds showed beneficial effect in reducing corrosion to varying degree and could be adopted in the canning industry. AA

607

Doblas (J), Voldrich (M), Pudil (F) and Curda (D). **The thermostability of paperboard food packing.** *Die Nahrung* 37(2); 1993; 115-118

Three different methods of isolation of volatiles released by heating of the paperboard were compared. The volatiles produced by 30-60 min of heating at 150°C were isolated by: (1) extraction with dimethyl ether (2) distillation with trapping in cooled diethyl ether and (3) adsorption on TENAX GC. The isolated volatiles were analyzed by GC coupled with the MS detection. The TENAX adsorption seems to give the best results, better than the other methods, by use of which not only volatiles were isolated and some part of volatiles was lost also by subsequent reactions of those. AA

FOOD ENGINEERING AND EQUIPMENT

608

Bassal (A), Vasseur (J) and Loncin (M). **Sorption isotherms of food materials above 100°C.** *Lebensmittel-Wissenschaft und - Technologie* 26(6); 1993; 505-511

Desorption isotherms and isobars are presented for microcrystalline cellulose (MCC), potato starch, cake dough and lactose measured at temp. between 100 and 140°C using a manometric and dynamic sorption method. From 9 mathematical models which have been transformed to take into account the effect of temp. and pressure, Oswin's modified model seems to be the best to fit the experimental data. Isosteric heat was calculated in this field of temp., for MCC, potato starch, and cake doughs using the Clausius-Clapeyron equation. The effect of

temp. on isosteric heat is negligible compared to that of moisture content. AA

609

Gonzalez Mendez (NF), Djelveh (G) and Gros (JB). **Performance of scraped surface heat exchangers in foaming food processes.** *Lebensmittel-Wissenschaft und - Technologie* 26(6); 1993; 538-543

The foaming process was studied in scraped surface heat exchangers (SSHE) under steady-state flow conditions. A model food was used; to ensure foaming, it was subjected to several experiments in batches using a stirred tank. These showed that temp. up to 50°C improved foaming capacity. Stability of the product was improved when temp. reached the temp. of protein coagulation. Concn. of starch up to 3 g/100 g increased apparent viscosity and improved stability of the product. In SSHEs foaming yield was similar to that obtained in a stirred tank. Foaming capacity depended on gas flow rate; rotation speed improved foaming capacity up to 1150 r.p.m. The advantage of SSHE over other rotor-stator mixers is the possibility of controlling the protein denaturing, and the stabilization and pasteurization of the product. AA

610

Hozova (B) and Takacsova (M). **The influence of combined storage procedures of foods on B vitamins content demonstrated at the example of heat sterilization and irradiation.** *Die Nahrung* 37(4); 1993; 345-351

Presents a literary survey of accessible information on the applications of binary and trinary combinations of preservation methods (thermosterilization and irradiation with other preservation methods) and on their influence on B vitamin groups (thiamine, riboflavin, vitamin B_6 and folacin) in comparison with traditionally used thermosterilization. The advantages of the combined techniques of preservation as a real possibility to replace the traditional preservation techniques by non-traditional and less destructive processes is also reported. BV

611

Jain (SK), Jain (RK) and Bera (MB). **Qualitative and quantitative analysis of dust pollution in dhal mill.** *Journal of Food Science and Technology (India)* 31(1); 1994; 55-57

In-plant air samples of *dhal* mills were analysed for their quantity, chemical makeup, paticle size and fungal profile. The av. concn. of suspended and settleable dust was 0.057 g/m^3 and 0.065 kg/m^2/day. The av. particle size of the suspended dust was found to be 3.2 μ, while the major portion of the dust was chemically organic in nature. *Aspergillus* and *Penicillium* species were found to be associated with the *dhal* dust. In-plant air samples of all the *dhal* mills were found to be severely polluted. Several pollution control measures are suggested. AA

Equipments

612

Anon. **A method for the assessment of in-line steam sterilizability of food processing equipment.** *Trends in Food Science and Technology* 4(3); 1993; 80-82

The procedures to test the in-line steam sterilizability of equipment recommended by the Test Methods subgroups of the European Hygienic Equipment Design Group are summarized. BV

ENERGY IN FOOD PROCESSING

Nil

FOOD CHEMISTRY AND ANALYSIS

Chemistry

613

Yen (G-C) and Tsai (LC). **Antimutagenicity of a partially fractionated Maillard reaction product.** *Food Chemistry* 47(1); 1993; 11-15

Maillard reaction product prepared by refluxing glucose (0.5 M) and tryptophan (0.5 M) at pH 11.0 and 100°C for 10 h was further

fractionated into different mol. wt. (MW) below 1000, 1000-5000, 5000-10000, 10000-30000, 30000-50000 and above 50000 by membrane filters. The trends of browning, reducing power, antioxidative activity and antimutagenicity of each glucose-tryptophan (GT) fraction were of MW above 5000 > unfractionated > MW below 1000. The antimutagenicity of each GT fraction exhibited a suitable correlation with these characteristics. The reducing power and antioxidative activity of each GT fraction played an important role in antimutagenicity. An inhibitory mechanism of GT was due to a desmutagenic effect but not a bio-antimutagenic effect. SD

614

Gorbachev (MYu), Gren (AI), Manzhos (AV) and Lobasyuk (BA). **Dependence of biological response on the geometric and electronic characteristics of phenol derivatives with smoke flavour.** *Die Nahrung* 37(2); 1993; 161-169

On the base of the data of conformational analysis and quantum-chemical calculation (method CNDO/2) of the series of phenol derivatives with smoke flavour it was shown that the structural fragment responsible for the odorant activity consists of the oxygen atom and 2 hydrogen atoms. The atomic orbitals of these atoms are constituting the highest occupied mol. orbid (HOMO) with the high values of the orbital coeff. of their 2pπ- and 1s-orbitals. The distance between the hydrogen atoms is 1.7 - 2.5 A, while the average distance (L) from these hydrogen atoms to the oxygen atom is 5.45 plus or minus 0.85 A. The dependence between the value of psychological response for the presence of the studied compounds within the gaseous phase and the value L was found. AA

615

Stauffer (CE). **Trypsin inhibitor measurement: Effect of order of reagent addition.** *Cereal Chemistry* 70(1); 1993; 111-112

Chemistry(Analytical)

616

Grosch (W). **Detection of potent odourants in foods by aroma extract dilution analysis.** *Trends in Food Science and Technology* 4(3); 1993; 68-73

Aroma extraction dilution analysis (AEDA) - a quantitative GC olfactometry procedure that is used to evaluate the activity of odourants; its application to the study of food flavours and off flavours; quantification of odour concn. in foods and calculation of odour active values (OAV) are reviewed. 50 references. GS

617

Hopia (A). **Analysis of high molecular weight autoxidation product using high performance size exclusion chromatography: I. Changes during autoxidation.** *Lebensmittel-Wissenschaft und-Technologie* 26(2); 1993; 563-567

Autoxidation of edible oils was studied by monitoring the levels of high mol. wt. autoxidation products using high performance size exclusion chromatographic analysis. The oils in question were 2 commercially available rapeseed oils, two soybean oils and 2 sunflower oils. Autoxidation of a non-refined sunflower oil with no initial polymeric compounds was also studied. Samples were autoxidized in the dark at 60°C. During the autoxidation an increase was detectable in the level of oxidized triacylglycerol monomeric (PTAG) and dimeric (TGD) compounds. No higher oligomeric compounds were detected in the samples. The content of PTAG compounds started to increase at the begining of autoxidation. After 4 days autoxidation, the content of TGD compounds had also increased in each of the samples. After 13 days autoxidation, the content of PTAGs was 39-167 g/kg and that of TGD compounds 5-28 g/kg. The PTAG and TGD contents of the oils depended on the autoxidation level rather than on the type of oil studied. The highest PTAG and TGD contents were detected in the samples with the highest peroxide values. AA

618

Hopia (A). **Analysis of high molecular weight autoxidation products using high performance size exclusion chromatography: II. Changes during**

processing. *Lebensmittel-Wissenschaft und - Technologie* 26(6); 1993; 568-571

High performance size exclusion chromatography (HPSEC) was used for analysing the quality of vegetable oils during the industrial refining process. The main interest focused on the contents of high mol. wt. autoxidation product: oxidized triacylglycerols (PTAG) and triacylglycerol dimeric compounds (TGD). The diacylglycerol and free fatty acid contents of the oils were also monitored. Three vegetable oils (sunflower oil, soybean oil and low euric acid rapeseed oil) were used as test materials. In crude oils, the content of PTAG compounds ranged from 5.3 to 9.0 g/kg of oil and that of diacylglycerols from 6.1 to 12.5 g/kg, indicating the different autoxidative and hydrolytic qualities of the raw materials. No dimeric or higher oligomeric TAG compounds were detected in crude oils. The major change during the refining process detected by HPSEC analyses was the increase in TGD content after bleaching and deodorization. In refined oils, the TGD content ranged from 1.2 g/kg for rapeseed oil to 2.3 g/kg for sunflower oil. A slight decrease in PTAG content after bleaching was detected in each of the samples. The content of PTAG compounds in refined oils was comparable to that in crude oils. The decrease in free fatty acid content after neutralization was clear but there was no change in the diacylglycerol content during the processing. HPSEC analysis is a suitable method for monitoring the level of high mol. wt. autoxidation products during the processing of edible oils and for analysing the autoxidative quality of oils after industrial refining. AA

619

Prieta (J), Moreno (MA), Bayo (J), Diaz (S), Suarez (G), Dominguez (L), Canela (R), Sanchis (V). **Determination of patulin by reversed-phase high-performance liquid chromatography with extraction of diphasic dialysis.** *Analyst (London)* 118(2); 1993; 171-173

A simple and economical method is reported for the detn. of patulin in apple juice. The sample is extracted with ethyl acetate in a diphasic dialysis system and the extract is cleaned up by elution from a Sep-Pak cartridge. Patulin is detected and determined by RP-HPLC using a Novopak C_{18} column and an ultraviolet detector. The lower detection limit is 1 μgl^{-1} and recovery is 85% at the 20 μgl^{-1} level. BV

FOOD MICROBIOLOGY AND HYGIENE

620

De Ruiter (GA), Notemans (SHW) and Rombouts (FM). **New methods in food mycology.** *Trends in Food Science and Technology* 4(4); 1993; 91-97

Reviews the current state of knowledge on the development and applicability of immunoassays for the detection of moulds in foods. The different types of immunoassays, rapidity, accuracy and sensitivity of the immunoassays in detecting moulds in heat treated or filtered food products are highlighted. GS

621

Sangsuk (O). **Immunosensors for food safety.** *Trends in Food Science and Technology* 4(4); 1993; 98-103

Reviews the affinity-based detection methods to identify food contaminants and microbial pathogens types of transducers adapted such as electrochemical, optical and piezoelectric transducers; immunoassay configurations; electrochemical interactions between antibodies and antigens; and prospects and application of immonosensors in food analysis and safety. 19 references. GS

Fermented foods

622

Bonestroo (MH), Kusters (BJM), de Wit (JC) and Rombouts (FM). **The fate of spoilage and pathogenic bacteria in fermented sauce-based salads.** *Food Microbiology* 10(2); 1993; 101-111

To investigate the possible growth and persistence of spoilers and pathogens, salads were inoculated with *Klebsiella pneumoniae*, *Bacillus cereus*, *Listeria monocytogenes* and *Staphylococcus aureus* and fermented with

lactic acid bacteria. A rapid decrease of pH, in addition to a low final pH (< 4.2) were necessary to inhibit the growth and survival of *Kl. pneumoniae*. Growth or survival of *B. cereus* in cabbage-ham salads inoculated with *Staph. aureus* (420 cfu g^{-1}) and fermented at 45°C with *Lactobacillus* spp., *Staph. aureus* increased 5 to 6 generations. Less growth occured in salads composed of ingredients with lower buffering capacities. Cabbage salads inoculated with *L. monocytogenes* and fermented with different strains of *Lactobacillus* spp., 2 to 3 generations of growth occured during fermentation followed by rapid decline to undetectable levels. SRA

Microorganisms

623

Notermans (S), In't Veld (P), Wijtzes (T) and Mead (GC). **A user's guide to microbial challenge testing for ensuring the safety and stability of food products.** *Food Microbiology* 10(2); 1993; 145-157

This article describes the theoretical aspects of microbiological challenge testing (MCT): identification of hazardous microorganisms (microbiological status of raw materials and end product, handling of the product following distribution, identification of risks of food-poisoning and product spoilage, properties of relevant microorganisms, growth potential of microorganisms in the product itself), carrying out microbiological challenge tests (design of a MCT, inoculating product with test organisms), an example of microbiological challenge testing: safety and stability of vacuum packed cooked potatoes. 15 references. SRA

624

Mayer-Miebach (E). **Food irradiation - a means of controlling pathogenic microorganisms in food.** *Lebensmittel-Wissenschaft und - Technologie* 26(6); 1993; 493-497

Salmonella enteritidis, *S. typhimurium*, *Campylobacter jejuni* and *Listeria monocytogenes* frequently cause foodborne infections. Food of animal origin, especially poultry, poultry products, eggs and egg products are main sources of contamination. To ensure hygienic quality of these products, it is necessary to take protective measures - not only of a hygienic nature. Food irradiation is one of the protective methods available. Comprehensive data concerning sensory, physiological and toxicological characteristics of irradiated food exist. However, to determine eventual sources of risk associated with the inappropriate use of radiation, it is necessary to generate additional comprehensive microbiological and engineering data for all foods concerned. Finally, predictive modelling will contribute considerably to the solution of the overall problem. 51 references. AA

Algae

Palmaria palmata

625

Lahaye (M), Michel (C) and Barry (JL). **Chemical, physiochemical and in vitro fermentation characteristics of dietary fibers from *Palmaria palmata* (L.) Kuntze.** *Food Chemistry* 47(1); 1993; 29-36

P. palmata (marine red algae, also known as dulse) contains 33.2 - 33.5% total dietary fibers. The yield of soluble fibres by simulated digestive tract conditions was lower (12.2%) than by the enzymatic/gravimetri method (18.9%). All soluble fibre fractions consisted of linear β-1, 4/β1,3 mixed linked xylans containing similar amounts of 1,4 linkages (70.5 - 80.2%). The insoluble fibres contained essentially 1,4 linked xylans with some 1,3 linked xylose and a small amount of 1,4 linked glucose (cellulose). Low intrinsic viscosities were measured from the soluble fibres (49.4 - 97.0 ml g^{-1}) and water holding capacities of dry dulse particles of 4.3 and 4.7 g g^{-1} were measured in buffer at pH 3.0 and 7.3 respectively. Soluble fibres are fermented within 6 h by human faecal bacteria into short chain fatty acids. SD

Bacteria

626

Manja (KS) and Sankaran (R). **Methods for determining bacterial populations in foods and food products: A critical evaluation.**

Journal of Food Science and Technology (India) 31(1); 1994; 1-10

This review critically analyses the methods for estimating bacterial populations in foods and discusses the rapid methods for food quality. The advantages and limitations of the methods are delineated. 109 references. SD

Clostridium sporogenes

627

Bowles (BL) and Jay (JM). **The effect of phenylglyoxal on *Clostridium sporogenes*.** *Food Microbiology* 10(2); 1993; 113-121

In general phenylglyoxal (PG) was found to inhibit anaerobic bacteria, with strict anaerobes being more affected than facultatives. The susceptibility of *Cl. sporogenes* vegetative cells to PG varied with the type of medium (20 - > 10,000 μg ml^{-1} PG), pH (20 - > 2500 μg ml^{-1} PG), and incubation temp. (625 - > 1250 μg ml^{-1} PG). However, optimum vegetative (20 μg ml^{-1} PG) and spore (< 1.0 μg ml^{-1} PG) inhibitions occurred in cooked meat medium for all conditions tested. PG was most active against vegetative cells at pH values > 7.5 and at temp. between 25-30°C. The compound inhibited sporogenesis (156 μg ml^{-1} PG) and replication processes (29 μg ml^{-1} PG), as well as deoxyribonuclease activity (4.28 μg ml^{-1} PG). Increased concn. of free α-amino acids and sulfhydryl-containing compounds antagonized the activity of PG against vegetative cells. Antigerminative effects appeared to occur optimally at low pH, and the heat resistance of *Cl. sporogenes* spores was reduced. Furthermore, PG concn. of 10 - 0.63 μg ml^{-1} prevented germination of *Cl. sporogenes* spores in 5 commercial soups and maintained their organoleptic qualities for 35 days at 30°C. AA

Pseudomonas fluorescens

628

Willocx (F), Mercier (M), Hendrickx (M) and Tobback (P). **Modelling the influence of temperature and carbon dioxide upon the growth of *Pseudomonas fluorescens*.** *Food Microbiology* 10(2); 1993; 159-173

In a temp. range of 4 to 12°C the lag time of *Ps. fluorescens* showed an exponential dependence with temp., whereas a linear relationship of max. absolute growth rate with temp. was observed. CO_2 was shown to be effective against the proliferation of aerobic psychrotropic γ-negative bacteria by principally increasing the lag phase and to a lesser extent the generation time. The dependence of the lag time and the max. absolute growth rate of *Ps. fluorescens* with the CO_2 concn. (0.03 - 15%, with an excess of O_2) was described using an exponential function. The effectiveness of the inhibition increased with decreasing temp. SRA

Salmonella

629

Todd (ECD), Mackenzie (JM) and Peterkin (PI). **Development of an enzyme-linked antibody hydrophobic grid membrane filter method for detection of *Salmonella* in foods.** *Food Microbiology* 10(2); 1993; 87-99

An enzyme-linked antibody hydrophobic grid membrane filter (ELA-HGMF) method was developed using M105 monoclonal antibody and EF-18 as a selective agar. 121 foods, feeds, animal by-products and feces were assayed using this method with the Health Protection Branch Standard Cultural Method as a reference procedure. 53 samples were positive for *Salmonella* by both procedures, and strains were isolated from 2 samples by the ELA-HGMF method alone. An attempt to shorten the time for enrichment from 24 to 6 h decreased the sensitivity of the method, and this modification was not pursued. The main advantage of the ELA-HGMF method is the relative ease of selection of *Salmonella* growth from the HGMFs. The use of ELA stain to detect the organisms on HGMFs enabled detection of a positive sample in 5 days and negative samples were detected within 4 days. SRA

Fungi

Mushrooms

630

Soumya Roy, Anantheswaran (RC), Shent (JS), Westerhaus (MO) and Beelman (RB).

Determination of moisture content of mushrooms by vis-NIR spectroscopy. *Journal of the Science of Food and Agriculture* 63(3); 1993; 355-360

Feasibility of the detn. of the moisture content of intact individual mushrooms (*Agaricus bisporus*) by visible and near infrared reflectance spectroscopy (Vis-NIR) was studied. The convection drying method was found to be suitable to obtain reference values for the calibration equation. The standard error of the lab. procedure ranged from 0.16 to 0.42%. Modified partial least square regression was used to develop the calibration equations. The importance of different segments of wavelength, the effect of light scattering and the use of data processing on the prediction of moisture content were evaluated. The equation obtained using the wavelength segment 600-2200 nm with first derivative and scatter correction had the best performance with a standard error of cross validation of 0.64%. This equation performed very well when validated using a separate set of mushrooms of the same kind as those in calibration set. This equation, however, did not perform well when using mushrooms from a different treatment. Accuracy of prediction was re-established by adding typical spectra from the second group of mushrooms to the calibration set and performing recalibration. AA

631

Kompany (E) and Rene (F). **Aroma retention of cultivated mushrooms (*Agaricus bisporus*) during the freeze-drying process.** *Lebensmittel-Wissenschaft und - Technologie* 26(6); 1993; 524-528

The retention of 5 major flavour components of cultivated mushrooms during freeze-drying was studied and the effect of process conditions on the kinetics of loss of these components was investigated. The loss of volatiles was independent of the volatility of the compound and the relative loss observed for 1-octen 3-ol was more important than that of other components, whatever the operating conditions. Optimum freeze-drying conditions were outlined for a max. retention of flavour components in the dry product. 1-octen 3-ol is considered as the most important mushroom flavour. From the study of retention of this component the optimum operating conditions with a varying heating plate temp. and chamber pressure were outlined. AA

BIOTECHNOLOGY

Nil

TISSUE CULTURE

Nil

FOOD ADDITIVES

632

Wedzicha (BL), Goddard (SJ) and Zeb (A). **Approach to the design of model systems for food additive-food component interactions.** *Food Chemistry* 47(2); 1993; 129-132

The rates of reactions between food additives and food components are affected by concn., ionic strength, non-electrolytes, pH, surfactants and solute transport. All these variables must be considered in the design of model systems. The importance of the medium to the progress of test reactions is illustrated and critically appraised. AA

Colourants

633

Biswas (G), Sarkar (S) and Chatterjee (TK). **Surveillance on artificial colours in food products marketed in Calcutta and adjoining areas.** *Journal of Food Science and Technology (India)* 31(1); 1994; 66-67

Toffees, biscuits, cakes, pastries, fried snacks, milk based sweets, besan and wheat based sweets, ready-to-serve beverages, beverage concentrates, ice candy, ice-cream, jam, jelly and custard powder products from Calcutta market were analysed for added synthetic colouring matters. The quantities of permitted colours in 93.4% of the products were within the range of 18-220 p.p.m. Foods made (6.6%)

by intinerant vendors, unorganised sectors, small and cottage scale industries contained non-permitted colours and colours above permissible limits. SD

CEREALS

634

Jideani (AI) and Akingbala (JO). **Some physicochemical properties of acha (*Digitaria exilis* Stapf.) and iburu (*Digitaria iburua* Stapf.) grains.** *Journal of the Science of Food and Agriculture* 63(3); 1993; 369-374

Some physicochemical properties of 2 cultivated species of *Digitaria* (*D. exilis* and *D. iburua*) were studied. Physical properties such as 1000-kernel wt., kernel size and water absorption rate of the grains were determined. Water absorption by both cereals exhibited a 2-stage pattern of swelling and solubility properties similar to other non-waxy cereal starches. Starch from acha swelled less than iburu, 7.3 compared with 7.8 for iburu. Chemical constituents such as protein, oil, crude fibre, ash, nitrogen-free extract and amylose were also determined. An amylose content of 280 g kg^{-1} was obtained for both cereal starches. Barbender amylograms obtained from starch and flour were typical of most normal, non-waxy cereals. Maize starch had relatively higher hot-paste and cold-paste viscosities than starches of the the 2 *Digitaria* species. AA

635

Grover (K), Sadana (BK) and Hira (CK). **Availability of trace minerals from cereal preparations.** *Indian Food Packer* 48(2); 1994; 39-44

The samples of whole wheat flour, refined wheat flour, semolina, broken wheat, whole maize flour, corn grains and rice were procured from 5 different locations in Ludhiana District, Punjab, India. Among all, the whole wheat flour was found to be the best source of trace minerals. The availability of trace minerals from chapatis and parantha was higher compared to other cereal preparations viz. puri, bread, biscuits, matter, halwa, dalia, maize chapati and popcorn. The availability of Zn was max. and that of Fe was min. The total mineral content was higher in maize chapati while the % availability was observed to be higher in popcorn. AA

636

Rouanet (JM), Laurent (C) and Besancon (P). **Rice bran and wheat bran. Selective effect on plasma and liver cholesterol in high-cholesterol fed rats.** *Food Chemistry* 47(1); 1993; 67-71

Plasma and liver cholesterol concn. were measured in Sprague-Dawley rats fed high-cholesterol (1% w/w) semipurified diets containing various fibre sources (10% w/w) for 21 days. The dietary contents of fibre were constant among the diets, except for the control diet which was devoid of fibre source. Rice bran (either crude or parboiled) produced lower plasma LDL cholesterol concn. than wheat bran. The content of liver cholesterol in rats fed rice bran diets was significantly lower than in rats fed the wheat bran diet. When comparing the compositions of the fibre sources, this study suggests that, apart form the polyunsaturated fatty acids of rice bran, the observed effects are mainly attributable to high soluble fibre content. AA

637

Corbini (G), Biondi (C), Proietti (D), Dreassi (E) and Corti (P). **Polarographic determination of total pyrethroid residues in stored cereals.** *Analyst (London)* 118(2); 1993; 183-187

A new method for detn. of the total cyanopyrethroid residue concn. in stored cereals by differential-pulse polarography is proposed. Cyanopyrethroids were previously extracted with a non-polar solvent and purified by solid-phase extraction. The total pyrethroid residue concn. are determined by differential-pulse polarography of 3-phenoxybenzaldehyde formed quantitatively by rapid and reproducible alkaline alcoholysis of the sample. The method is linear, quantitative and reproducible for maize and wheat analysis in the range 0.1 - 3.0 mg kg^{-1}. A TLC method for identification of 6 widely used cyanopyrethroids in the sample is described. The elctrodic reduction process of

3-phenoxybenzaldehyde is examined and the reduction products isolated and identified. AA

638

Chan (K-Y) and Wasserman (BP). **Direct colorimetric assay of free thiol groups and disulphide bonds in suspensions of solubilized and particulate cereal proteins.** *Cereal Chemistry* 70(1); 1993; 22-26

A direct colorimetric method that simultaneously combines measurement of solubilized and insoluble thiol groups and disulphide bonds in corn meal-based materials is described. Ellman's reagent, 5,5'-dithiobis (2-nitrobenzoic acid), which reacts specifically with thiol groups, or disodium 2-nitro-5-thiosulfobenzoate, which reacts with cysteine and thiol groups formed after reduction of disulphide bonds with sodium sulphite, were reacted directly with corn meal in the presence of surfactants (urea and/or sodium dodecyl sulphate), releasing the soluble chromophore 2-nitro-5-thiobenzoate. After a clarification step to remove suspended material, absorbance at 40 mesh and dried amino acid analysis. Twin-screw extrusion of corn meal at 150°C at moisture levels of 16 and 18% had no significant effect on cysteine or disulphide bond levels. Other possible changes such as disulphide bond rearrangements could not be determined by the mixed-phase assay. This method provides a rapid and convenient means for screening thiol and disulphide levels in insoluble proteinaceous materials. AA

639

Chan (K-Y) and Wasserman (BP). **Rapid solid-phase determination of cereal protein using bicinchoninic acid.** *Cereal Chemistry* 70(1); 1993; 27-28

A modification of the bicinchoninic acid (BA) assay that can be used for the rapid detn. of protein in cereal-based materials is described. Samples are directly suspended in BA reagent, where under sonication the protein undergoes reaction and a soluble purple chromophore is released. After a clarification step, absorbance readings are obtained and protein quantified by comparison with a standard curve. In the various corn-derived fractions tested, the solid-phase assay was linear with the amount of sample added, and high reproducibility was observed between replicates. With two commercially prepared flours (Micro-Crisp and Pure n Thick), direct comparisons with the Kjedahl assay showed general agreement. In two other samples (corn meal and zein), higher readings, possibly derived from the contribution of nonprotein N, were obtained by the Kjeldahl assay, especially when numerous insoluble proteinaceous materials require screening. AA

640

Rybka (K), Sitarski (J) and Raczynska-Bojanowska (K). **Ferulic acid in rye and wheat grain and grain dietary fiber.** *Cereal Chemistry* 70(1); 1993; 55-59

The aim of the present work was to examine the effect of cross-linking of rye and wheat arabinoxylan by ferulic acid on grain nutritive value, measured *in vitro* by an enzymatic test. Detn. of ferulic acid was based on spectrophotometric measurements of defatted samples at 320 nm. Approx. 80% of the *trans*-ferulic acid, the dominant phenolic acid of rye and wheat grain, was found in the bran of both species. Total content and extractability of free and esterified ferulic acid by water, ethanol, and alimentary enzymes (soluble dietary fiber) from grain meal were significantly higher in rye than in wheat. The activity of peroxidase, the enzyme thought to be responsible for the formation of diferulic bridges, was also significantly higher in rye. Most (85-90%) of the alkaline-soluble ferulic acid in grain was localized in the insoluble dietary fiber, and only about 5% was in the soluble fraction. Inspite of the higher solubility of rye arabinoxylans and the higher arabinose:xylose ratio in rye than in wheat grain, the ratio of the number of arabinose residues per ferulic acid molecule was not significantly higher in the soluble fiber of rye. Thus, cross-linking of grain hemicellulose components by ferulic bridges does not appear to contribute to the known differences in the structure, mol. wt., and nutritive properties of soluble fiber of rye and wheat. AA

641

Bhatty (RS). **Extraction and enrichment of (1-3),(1-4)-β-D-glucan from barley and oat brans.** *Cereal Chemistry* 70(1); 1993; 73-77

β-Glucan was extracted and purified from Tupper barley bran (6.6% β-glucan), Azhul barley bran (13.4% β-glucan), and commercial oat bran (6.9% β-glucan) with solvent 1 and, in the case of Azhul barley bran, with two additional solvents (2 and 3). Solvent 1 was distilled water adjusted to pH 10 with 20% sodium carbonate, solvent 2 was distilled water adjusted to pH 7, and solvent 3 was 4% (w/v) sodium hydroxide. Solvent 1 extracted 61-64% of the total β-glucan from the barley brans and 70% from oat bran; solvents 2 and 3 extracted 72 and 84%, respectively, from Azhul barley bran. The final yields, in percent β-glucan recovered from barley brans, were solvent 1, 52-55%; solvent 2, 40%; solvent 3, 81%. The yield from oat bran with solvent 1 was 61%. The purified preparations contained 72-81% β-glucan + pentosans from barley brans and 84% from oat bran, expressed on an ash-free basis. They also contained 0.2-0.5% total nitrogen, 0.4-1.2% starch, 1.1-10.9% pentosans, and 3.7-12.6% ash. Ether extract was not detected in any of the preparations. Enrichment index, calculated by percent yield X (percent β-glucan + pentosan, ash-free basis)/100, was highest for solvent 3 (65), lowest for solvent 2 (33), varied from 38 to 51 for solvent 1. Sodium hydroxide (solvent 3) appeared to be a better solvent for extraction and purification of β-glucan from barley bran. Size-exclusion chromatography of the 3 β-glucan preparations from Azhul barley bran suggested an apparent mol. wt. of about 2×10^6. Mol. wts. of the preparations were not correlated with their flow viscosity. AA

Barley

642

Gupta. M. and Khetarpaul (N). **Effect of rabadi fermentation on phytic acid and *in vitro* digestibility of barley.** *Die Nahrung* 37(2); 1993; 141-146

Rabadi, an indigenous fermented food, was prepared by mixing cereal flour with butter milk, allowing it to ferment at 30, 35 and 40°C for 6, 12, 18, 24 and 48 h and cooking the fermented mixture for 0.5 h with continuous stirring. Two types of *rabadi* were prepared i.e. autoclaved and unautoclaved. In autoclaved type of *rabadi* cereal flour was mixed with water, autoclaved (0.103 MPa = 15 psi for 15 min), cooled, mixed with buttermilk and fermented. As this type of *rabadi* was precooked prior to fermentation, hence, the fermented product did not require cooking afterwards, while in unautoclaved *rabadi*, barley flour and buttermilk were mixed, fermented and then cooked prior to consumption. Phytic acid was reduced drastically at all the temp. and periods of fermentation in both autoclaved and unautoclaved type of *rabadi*; greater reduction occurred at higher temp. and duration of fermentation. A significant improvement in the *in vitro* digestibility of starch and protein was observed, max. improvement was noticed when fermentation was carried out at 40°C for 48 h in both the types of *rabadi*. Phytic acid had a significant ($P < 0.05$) negative correlation with digestibility (*in vitro*) of proteins and starch of barley flour *radabi*. AA

Oats

643

Inglett (GE). **Amylodextrins containing β-glucan from oat flours and bran.** *Food Chemistry* 47(2); 1993; 133-136

Amylodextrins with soluble β-glucan contents as high as 10% were prepared from milled oat flours and bran. The level of enzymatic conversion was measured by HPLC and gel permeation chromatography. The large mol. wt. amylodextrin fragments containing the β-glucan from low level amylolytic conversions were measured by gel permeation chromatography. The different elution times of the two separate enzyme conversion mixture components suggest different modes of enzyme actions. Lower mol. wt. fractions are produced by the action of *Bacillus licheniformis* α-amylase in contrast to the action of *B. stearothermophilus* α-amylase, due possibly to dissimilar enzyme dosages. Comparisons of the amylodextrin compositions produced by *B. stearothermophilus* α-amylase and *B. licheniformis* α-amylase systems at intermediate conversion levels revealed that

the *B. stearothermophilus* α-amylase gave much larger quantities of the maltohexaose component than the *B. lichenlformis* α-amylase. AA

Rice

644

Resurreccion (AP), Li (X), Okita (TW) and Juliano (BO). **Characterization of poorly digested protein of cooked rice protein bodies.** *Cereal Chemistry* 70(1); 1993; 101-104

Poorly digested protein bodies from cooked IR58 milled rice were prepared by destarching with *Aspergillus oryzae* α-amylase followed by one or two pepsin treatments. The preparation was further purified by gel filtration through a Bio-Gel A-5m column with 0.5% sodium dodecyl sulphate in 0.05M Tris-HCl (pH 8.6) buffer as eluant. The major polypeptide had a high sulphur amino acid content and a molecular size of about 13-kDa, slightly smaller than that of the 15-kDa rice prolamin. The 13-kDa polypeptide was identified as a prolamin based on Western blot analysis, and it is probably a proteolytic product of the class of 15-kDa rice prolamins that are rich in sulphur-containing amino acids. AA

Wheat

645

Bettge (AD) and Pomeranz (Y). **Air-aspirated cleaning to separate sound from preharvest-sprouted wheat.** *Cereal Chemistry* 70(1); 1993; 36-41

An air-aspirated wheat cleaner fractionated two sets of preharvest-sprouted wheats (falling numbers 62-376) through the combined influences of aerodynamic drag, kernel vol., and kernel wt. One set was fractionated at a water column (WC) air pressure of 3.81 cm (1.5 in); the other set was fractionated under WC air pressures of 2.54, 3.81 and 5.08 cm (1, 1.5 and 2 in., respectively). Each treatment resulted in a lifted fraction and a fraction passing through the air-aspirated cleaner. The fractions, plus the original grain, were analyzed for physicochemical, α-amylase, and end-use parameters. The first set of samples showed significant physical and physicochemical differences between lifted and throughs fractions. The improvements were most meaningful for wheats of moderate preharvest sprouting (falling numbers between 200 and 300). Throughs fractions produced better sponge cakes, in vol. and texture, than the other fractions. The second set of samples exhibited a similar pattern: significant improvement in wheat of moderate preharvest sprouting but no meaningful improvements in either highly or lightly sprouted samples. Significant improvement was observed in fractions passing through the aspirator relative to the original and to the lifted fractions in samples of moderate preharvest sprouting. This improvement was most evident in the fraction passing through the aspirator at 5.08 cm WC air pressure. Aspiration at this air pressure causes about 50% of the sample to be removed. AA

646

Hatcher (DW) and Kruger (JE). **Distribution of polyphenol oxidase in flour millstreams of Canadian common wheat classes milled to three extraction rates.** *Cereal Chemistry* 70(1); 1993; 51-55

Polyphenol oxidase (PPO) levels were determined on individual and pooled millstreams of 5 cvs representative of 5 different classes of Canadian wheat. The wheats were milled on a pilot mill to extraction rates of approx. 75 (conventional), 80 and 85%. Enzyme activity in individual streams ranged widely by increased with increasing bran contamination in the millstreams. With the exception of the soft spring wheat cv., PPO levels, as a percentage of total activity, were similar for the different wheats at similar cumulative flour yield. Less than 10% of the total PPO activity was present in cumulative flour streams corresponding to 70% extraction, after which the amount of the enzyme rapidly increased. Slightly more PPO activity appeared in the lower ash streams if the wheats were milled to a higher extraction using this mill flow. PPO activity was linearly correlated with ash content (up to 2.0% ash) and flour grade colour figure (up to 5 units). AA

647

Kaldy (MS), Kereliuk (GR) and Kozub (GC). **Influence of gluten components and flour**

lipids on soft white wheat quality. *Cereal Chemistry* 70(1): 1993; 77-80

Soft white wheat flours from varied growing conditions were analyzed for selected variables of gluten and components of flour lipid to identify those that are associated with baking quality as measured by cookie diam. and cake vol. Statistical analysis indicated that among the gluten variables, yield of gluten and pentosan in gluten were the variables most associated with cookie diam. corrected for protein content. However, when the correction for protein content was not taken into account, total protein was shown to be negatively correlated with cookie diam. Among the components of flour lipid, polar lipid had the highest correlation with cake vol. These variables, therefore, appear to be important in the end-use quality of soft white wheat. AA

648

Symons (SJ) and Dexter (JE). **Relationship of flour aleurone fluorescence to flour refinement for some Candadian hard common wheat classes.** *Cereal Chemistry* 70(1): 1993; 90-95

Millstreams from pilot-scale millings of commercially grown wheats from the Canadian hard common wheat classes Canada Western Red Spring, Canada Prairie Spring, Canada Western Red Winter, and Canada Western Utility were used to evaluate the potential of fluorescence imaging of aleurone tissue as a flour refinement indicator. Flour aleurone fluorescence was measured using UV excitation (excitation 365 nm, barrier > 420 nm). Aleurone fluorescence is acknowledge to be due to ferulic acid, which is highly concentrated in aleurone cell walls. In the current study, for every wheat class examined, aleurone fluorescence was highly correlated with ferulic acid content for every millstream with the exception of bran finisher flour. Bran finisher flour gives a moderate aleurone fluorescence despite a high level of ferulic acid. For all wheat classes, break flours gave a distinctly lower aleurone fluorescence than did reduction flours of comparable ash content and colour; the former have a lower aleurone content on the basis of ferulic acid content. Aleurone fluorescence had good potential for on-line monitoring of mill performance because it is strongly related ($P < 0.01$) to the ash content and brightness of reduction flours, a primary determinate of mill efficiency, for all wheat classes. The relationships of aleurone fluorescence to flour ash content and flour colour were homogenous for Canada Western Red Spring wheats from three crop years and two locations but were heterogeneous between wheat classes. AA

649

Wong (JH), Kobrehel (K), Nimbona (C), Yee (BC), Balogh (A), Kiss (F), Buchanan (BB). **Thioredoxin and bread wheat.** *Cereal Chemistry* 70(1): 1993; 113-114

650

Srivastava (AK) and Haridas Rao (P). **Changes in the functional characteristics of wheat during high temperature storage.** *Journal of Food Science and Technology (India)* 31(1): 1994; 36-39

Storage of wheat at different temp. showed considerable deterioration in grain quality. The deterioration was more in wheat stored for 5 months at 50°C. Storage of wheat at higher temp. for longer duration decreased both the 1000 kernel and hectolitre wts. Duration of storage also adversely affected the milling yield. Increases in colour grade value and ash content in flour were observed with increases in storage temp. and time. Storing of wheat at higher temp. affected the α-amylase activity and this was indicated by an increase in falling number and amylograph peak viscosity values. Rheological studies showed a decrease in farinograph water absorption and an increase in resistance to extension in wheat stored for 5 months at 50°C. Baking tests revealed that, even though the quality of bread improved to some extent in wheat stored at 27 and 37°C, storage of wheat at 50°C considerably reduced the bread quality. AA

Wheat flour

651

Sharma (N), Hanna (MA) and Chen (YR). **Flow behaviour of wheat flour-water dough using a capillary rheometer. I. Effect of capillary geometry.** *Cereal Chemistry* 70(1): 1993; 59-63

A capillary extrusion rheometer was employed for detailed investigation of the flow behaviour of wheat flour-water dough. Dough was extruded at ambient conditions through capillaries of different lengths and diam. In the shear rate of 9-5,000 sec^{-1}, the dough exhibited shear thinning with an average flow behaviour index of 0.34 and consistency coeff. of 2, 395 $Pa\text{-}sec^{0.34}$. The flow curves, corrected for end effects and for effect of die diam. on shear rates, were independent of capillary dimensions. The capillary rheometer technique was found to be a reliable and repeatable method for determining flow parameters of viscous materials such as dough. AA

652

Sharma (N), Hanna (MA) and Marx (DB). **Flow behaviour of wheat flour-water dough using a capillary rheometer. II. Effects of water, protein, mix and rest time.** *Cereal Chemistry* 70(1); 1993; 63-67

Doughs made with various combinations of water, protein, and mix and rest times were extruded at ambient temp. through a capillary of known geometry. The flow behaviour of the doughs was described by a power law model. The consistency coeff. decreased with increasing water content in the doughs, but it increased with increasing protein content. Mix and rest times did not show a significant effect on the consistency coeff. The flow behaviour indices were not affected by water, protein, mix time, or rest time over the ranges studied. The consistency coeff. were predicted within reasonable accuracy by a quadratic model including only water and protein as independent variables. The quantification of flow properties could be used for quality control using automated process control in bakeries of the future. AA

653

Graybosch (R), Peterson (CJ), Moore (KJ), Stearns (M) and Grant (DL). **Comparative effect of wheat flour protein, lipid, and pentosan composition in relation to baking and milling quality.** *Cereal Chemistry* 70(1); 1993; 95-101

Variation in milling, baking and dough-handling properties among 58 hard wheat (*Triticum aestivum*) flours was examined in relations to the variation in flour protein and lipid concn. and composition and the variation in water-soluble pentosan concn. Simple correlations showed no single biochemical component capable of explaining more than 41% of the variation in any given quality parameter. Similarly, no single biochemical component was highly related to all quality attributes. Canonical analyses, a multivariate statistical approach, revealed that the measured biochemical components were able to explain more than 90% of the variation in major quality attributes such as dough-handling and loaf characteristics. Flour protein concn. was found to be the primary factor contributing to variation in both dough strength and loaf characteristics. Once the primary effects of protein concn. were established, flour polar lipid concn. showed substantial positive contributions to dough handling. Loaf textural features largely unrelated to protein concn.; however, glutenin concn., water-soluble pentosans, and flour lipids showed positive relationships. Assay of numerous biochemical components together with multivariate approaches may be needed to develop effective predictive models for observed variation in wheat end-use quality. AA

MILLETS

Corn

654

Vaidya (PS), Nigam (SN) and Jaiswal (PK). **Assesment of aflatoxin (B_1) in maize in Nagpur market.** *Beverage and Food World* 21(1); 1994; 15

Twenty maize samples were analyzed for aflatoxin B_1 contamination. 6 samples contained aflatoxin B_1 in the range of 16.0 p.p.b. to 24.0 p.p.b. Only 1 sample contained aflatoxin B_1 as 31.2 p.p.b. which is beyond the max. permissible limit of 30 p.p.b. 13 samples were found free from aflatoxin. SRA

655

Hu (L), Hsieh (F) and Huff (HE). **Corn meal extrusion with emulsifier and soybean fiber.** *Lebensmittel-Wissenschaft und - Technologie* 26(6); 1993; 544-551

Twin-screw extrusion of corn meal with monoacylglycerol (MAG) and soy fiber was investigated. The treatment variables studied were MAG and soy fiber contents, screw speed, and feed rate. MAG addition reduced torque, specific mechanical energy, and dough temp., but increased die pressure. The significant increase in die pressure was caused by an increased length in filled flights. Die pressure and dough mass temp. increased with soy fiber addition at lower MAG contents (< 0.4 g/100 g). The trends were reversed at higher MAG contents (> 0.4 g/100 g). Moreover, MAG-starch complexation increased with MAG addition but was impeded by soy fiber addition. AA

656

Dombrink-Kurtzman (MA) and Bietz (JA). **Zein composition in hard and soft endosperm of maize.** *Cereal Chemistry* 70(1); 1993; 105-108

Maize protein composition and distribution may directly influence endosperm texture and physical properties. To test this hypothesis, the compositions of alcohol-soluble proteins in maize endosperm was compared with the hard and soft fractions of 8 normal genotypes. Kernels were hand-dissected to obtain fractions differing in texture. Endosperm fractions were extracted with a sol. containing alcohol, reducing agent, and sodium acetate and were analyzed by sodium dedecyl sulphate-polyacrylamide gel electrophoresis and by the reversed-phase HPLC. More (an av. of 3.3 times) α-zeins (19 and 22 kDa) was found in hard endosperm fractions than in soft endosperm fractions. In contrast, soft endosperm fractions contained nearly twice as much 27-kDa γ-zein (based on percent) than did hard endosperm fractions. Thus, distribution of the various types of zeins was not uniform throughout the maize endopserm. The results suggest that the zein composition of protein bodies in normal maize kernels may be correlated with texture of the endosperm from which the sample was obtained. AA

657

Paul (MC) and Mishra (RR). **Effect of fungal infestation on the starch, lipids and dry weight of maize seeds.** *Journal of Food Science and Technology (India)* 31(1); 1994; 52-54

Infestation of 3 var. of maize (*Zea mays* L.) by 6 dominant maize seed fungi viz. *Alternaria alternata*, *Aspergillus flavus*, *Fusarium moniliforme*, *Penicillium expansum*, *Rhizopus nigricans* and *Trichoderma viride*, resulted in the reduction in dry wt., increase in fat acidity and depletion of starch. *Asp. flavus* increased fat acidity in 'Local White' var. and 'Vijay' (53.5% and 69.2%) and *P. expansum* in 'VL-16' var. (74.2%), after 30 days of incubation. Starch depletion was found to be slow during the initial phase of incubation, but became pronounced after 30 days of incubation. *Asp. flavus* showed max. depletion of starch (48.5%) and *A. alternata* the least (25.3%). Highest reduction in dry wt. of the seeds was in case of *Asp. flavus*. AA

Corn starch

658

Huang (JJ) and White (PJ). **Waxy corn starch: Monoglyceride interaction in a model system.** *Cereal Chemistry* 70(1); 1993; 42-47

The interaction between waxy corn starch and monoglyceride (MGs) (monolaurin, monomyristin, monopalmitin, and monostearin) was investigated by the measurement of starch-MG complex formation, iodine affinity, differential scanning calorimetry, and texture measurements in model systems. All MGs formed some amount of complex with waxy corn starch, but no significant differences occurred among the MG types. Iodimetric titrations of the complexes also showed that the presence of MGs significantly decreased the iodine affinity of the amylopectin when compared with that of the control. Gelatinization and retrogradation behaviour of starch-MG mixtures were measured by using differential scanning calorimetry. Compared with that of the control, the gelatinization onset temp. decreased significantly in the presence of MGs, except for monostearin; moreover, statistically lower enthalpies were noted for the treatments

containing MGs, except for the treatment with monomyristin. After retrogradation, the enthalpies of recrystallized starch for systems containing monolaurin, monomyristin, and monopalmitin were statistically lower than that of the control. Gel firmness and cohesiveness measurements with the Voland-Stevens texture analyser revealed little patterns in the effects of MGs on waxy maize starch gelatinization. AA

659

Yuan (RC), Thompson (DB) and Boyer (CD). **Fine structure of amylopectin in relation to gelatinization and retrogradation behaviour of maize starches from three wx-containing genotypes in two inbred lines.** *Cereal Chemistry* 70(1); 1993; 81-89

Pearl millets

660

Kumar (A) and Chauhan (BM). **Chemical composition and utilization of pearl millet sprouts.** *Die Nahrung* 37(4); 1993; 356-363

Pearl millet (*Pennisetum typhoideum*) grains were germinated at 25°C (48, 54 and 60 h), 30 and 35°C (36, 42 and 48 h) to obtain a desirable size of sprouts. The sprouting improved total protein, ash, ascorbic acid, total soluble sugars, reducing sugars, non-reducing sugars and fibre content and diminished starch and fat. The sprouts, when incorporated in various foods including salad, weaning foods, biscuits, cake and *rabadi* (an indigenous fermented food), were found to be acceptable. BV

661

Chavan (JK) and Kachare (DP). **Effect of seed treatment on lipolytic deterioration of pearl millet flour during storage.** *Journal of Food Science and Technology (India)* 31(1); 1994; 80-81

Pearl millet seeds were subjected to soaking in dilute acid sol. (0.05 N HCl), dry-heating (50°C for 60 min or 100°C for 10 min) and boiling water-blanching (98°C for 30 sec) treatments, before grinding to flour. The changes in fat acidity in the flour during storage at ambient temp. were monitored. Boiling water-blanching treatment was found to completely arrest the development of the fat acidity in the flour, during 30 days storage at ambient temp. The acid-soaking of seeds was partially effective, while the dry-heating of seeds was found to be totally ineffective for this purpose. AA

662

Sainani (MN), Gupta (VS), Mishra (VK), Lachke (AH), Ranjekar (PK), Pillay (DTN). **Effect of chemical modification on some structural and functional properties of pennisetin, a major seed storage protein from pearl millet.** *Phytochemistry* 34(4); 1993; 919-925

Nine different types of amino acids of pennisetin, a major storage protein in pearl millet, were modified separately and the effect of this modification was assessed by determining certain structural and functional properties. With modification of histidine, tyrosine, methionine and cysteine, there was an increase in intrinsic viscosity (η) from 16.8 to 20.5 $ml g^{-1}$ while that of serine led to a decrease (η) from 16.8 to 14.9 $ml g^{-1}$ indicating alteration in the molecular dimensions of pennisetin. The CD spectra of pennisetin modified at serine, lysine, methionine and cysteine residues showed changes in molar ellipticity values reflecting some changes in its secondary structure. The water holding capacity of pennisetin showed a max. increase in the case of serine modification (1.76-4.32 g of $H_2O g^{-1}$ of pennisetin) and a max. decrease in lysine modification (1.76-1.26 g of $H_2O g^{-1}$ of pennisetin). The thermostability of pennisetin remained unaffected with modification of amino acids except in the case of glutamic and aspartic acid. This is the first report where a specific seed storage protein of an important food crop is chemically modified and its effects are studied with respect to its structural and functional properties. AA

Ragi

663

Singh (D), Chauhan (GS), Verma (NS) and Tyagi (SM). **Physical, chemical and milling characteristics of ragi varieties.** *Bulletin of Grain Technology* 31(1); 1993; 61-66

Twelve var. of ragi (*Eleusine coracana*) viz., early maturing (PES-144, $T_{56}B$, T_{25-1}); medium maturing (VL-101, PES-176, PM-4, HR 374, PES-224) and late maturing (PES-110, PR-202, HR-45, PR-1044) were studied for their physical, chemical and milling characteristics. 1000 kernels (grains) wt. and the diam. of these var. ranged between 2.16 - 5.00 g and 1.33 - 1.60 mm, respectively. Var. T_{25-1} ranked first in protein and crude fiber, VL-101 in fat, PR-202 in carbohydrate and P, HR-43 in ash and PM-4 in Ca content. Conditioning at 16.5% moisture level was found to be optimum for optimal flour yield with min. colour values. The yield of various fractions of the flour in different var. were found to be directly proportional to the total flour yield. Overall, the var. in late maturing group yielded max. % of flour followed by the medium and early maturing groups. It was interesting to note that within various maturity groups the colour values were generally inversely proportional to the flour yield. AA

PULSES

664

Oshodi (AA) and Hall (GM). ***In vitro* multienzyme digestibility of protein of some plant source flours blended with bovine plasma protein concentrate.** *Journal of the Science of Food and Agriculture* 63(3); 1993; 323-327

The *in-vitro* multienzyme protein digestibilities of the flours of maize, cassava, pigeon pea (*Cajanus cajan*), African yambean (*Sphenostylis stenocarpa*) and bambara groundnut (*Vigna subterranea*), blended with bovine plasma protein concentrate were investigated. The multienzyme system consists of trypsin, chymotrypsin and peptidase. It was found that the addition of bovine plasma protein concentrate improved the protein digestibility of the flours compared with flours without the additive. The digestibilities were increased by between 3% in bambara groundnut blended flour to about 10% in cassava blended flour. When the flours were wet-heat treated, the digestibilities further increased in all samples with increments between 7.5% in bambara groundnut and 16.6% in cassava flour. Bovine plasma protein concentrate may be a good source of protein for the fortification of protein-deficient foods, particularly maize and cassava flours. AA

665

Rajni Modgil and Usha Mehta. **Protein and methionine content of pulses infested with *Callosobruchus chinensis* (L.) (bruchids).** *Die Nahrung* 37(2); 1993; 170-172

The present study was concerned with the changes in the levels of crude protein, true protein and methionine in 3 commonly consumed pulses (Bengal gram, green gram and red gram) at 6 different levels of *C. chinensis* (L) infestation. BV

666

Rajni Modgil and Usha Mehta. **The effect of different levels of *Callosobruchus chinensis* (L.) infestation on B-vitamins and mineral content of pulses.** *Die Nahrung* 37(2); 1993; 173-176

667

Ramanuja (MN), Vibhakara (HS) and Jayaraman (KS). **Studies on the changes in peroxidase levels in cluster bean (*Cyamopsis tetragonoloba*) and cowpea (*Vigna unguiculata* L.) during development.** *Journal of Food Science and Technology (India)* 31(1); 1994; 11-14

Peroxidasee activity, protein content, av. wt. and moisture content of cluster bean and cowpea during 8 stages of development were studied. Peroxidase activity which increased upto the stage of maturity, declined largely till the stage of senescence. The soluble protein which first declined, increased and reached max. at senescent stage. The isoenzyme patterns of peroxidase varied during development, with cluster beans possessing two isoenzyme bands, cowpea five bands initially and a sixth band at maturity stage. SD

Bengalgram

668

Singh (S), Awasthi (R) and Gupta (SP). **Effect of neutral tannins on canned green Bengalgram (*Cicer arietinum*).** *Journal of*

Food Science and Technology (India) 31(1); 1994; 49-51

Effect of process operations and natural tannins on the quality of canned green *Bengalgram* indicated that the tannins from green leaf tissue of *Bengalgram* are highly suitable as blanching and covering medium. It maintained the colour of the seeds and imparted acceptability to the product. AA

Carobs

669

Albanell (E), Plaixats (J) and Cya (G). **Determination of chemical composition of carob pods by near-infrared reflectance spectroscopy.** *Journal of the Science of Food and Agriculture* 63(3); 1993; 309-312

Results obtained demonstrate that the optimal number of wavelengths (WL) to predict chemical composition in carob pulp is the same (3 terms) for dry matter and crude protein while 6 WL terms are needed for reducing sugars. NIR reflectance spectroscopy technique can be used to evaluate the quality of carob pulp from different geographical areas quickly and accurately. This has not been reported previously. BV

Chickpeas

670

Punia (D) and Chauhan (BM). **Nutrient make up, level of antinutrients, cookability and consumer preferred characteristics of high yielding chickpea varieties.** *Bulletin of Grain Technology* 31(1); 1993; 44-51

Three chickpea var. were studied for hydration capacity, hydration index, swelling capacity (SC), swelling index and cooking time. Except SC, other parameters varied among var. There were no change in the values of proximate principles and protein digestibility (*in vitro*). Carbohydrates, phytic acid, polyphenols, saponins and trypsin inhibitors varied significantly. Lectin was present in all the var. GS

671

Singh (A) and Mehta (U). **Cookability and organoleptic properties of chickpea (*Cicer arietium*) varieties.** *Bulletin of Grain Technology* 31(1); 1993; 52-57

Sixteen var. of chickpea (*C. arietinum*) were studied for soakability, cooking period in tap water and distilled water, seed appearance, colour, flavour, texture, taste, feel in the mouth and overall acceptability. In tap water, soakability of seeds was slightly more and cooking period higher than in distilled water. The range of wt. increase was 57.5 to 72.5%. Cookability of all the Desi var. were similar but had significantly higher cooking period than that of Kabuli var. Flavour of none of the var. was highly liked. The scores for texture ranged between 5.33 to 7.1. All the var. except C-235 and H-84-70 showed moderately liked texture, acceptable taste and good overall acceptability. GS

Cowpeas

672

Giami (SY) and Okwechime (UI). **Physicochemical properties and cooking quality of four new cultivars of Nigerian cowpea (*Vigna unguiculata* L. Walp.).** *Journal of the Science of Food and Agriculture* 63(3); 1993; 281-286

Four new cowpea cvs (IT81D-699, IT82E-18, IT84S-2246-4 and TVx 3236) were evaluated for their physicochemical properties and cooking quality. The 4 cvs fell into 2 categories (rough and smooth) according to testa texture, and varied in seed dimensions and wts with IT81D-699 and IT84S-2246-4 having smaller seed vol. than IT82E-18 and TVx 3236. Leached solids, swelling capacity and seed coat percentage were within a range of 0.33-0.94 g/100 g, 77.0-123.5 g/100 g and 5.6-15.7% w/w of dry beans respectively. The total polyphenol content of the brown or cream-coloured beans were similar (1.53-1.96 mg g^{-1}) but higher than the amount (1.03 mg g^{-1}) found in the white bean. Cooking time varied between 29 and 37 min and was reduced by about 21% following a presoaking treatment in water for 12 h at room temp. (28°C). Cooking time was significantly positively correlated ($P < 0.05$) with seed wt., ($r = 0.82$) and seed vol. ($r = 0.75$). . Water absorption was not related to

cooking time, and was much lower for the cv with larger seeds. No significant difference in hardness was found between unsoaked beans cooked for 30 min and soaked beans cooked for 10 min, suggesting that cookability for all cvs was improved through soaking. AA

673

Singh (P) and Bhattacharya (L). **A study on cooking time and its relationship with physical characteristics of cowpea (*Vigna sinensis*).** *Bulletin of Grain Technology* 31(1); 1993; 69-70

Five cowpea var. UPC-124, UPC-125, UPC-126, UPC-287 and F-Bulk were evaluated for their cooking time, seed size, vol. density, hydration capacity, hydration index, swelling capacity and swelling index. The observed physical characters were not largely responsible for the cooking time required for cowpea. GS

674

Marconi (E), Ng (NQ) and Carnovale (E). **Protease inhibitors and lectins in cowpea.** *Food Chemistry* 47(1); 1993; 37-40

Wild *Vigna vexillata* showed significantly higher trypsin and chymotrypsin inhibitors and significantly lower lectins as compared with cultivated accessions of cowpea implying that domestication operates an indirect selection for these characters. Correlation between chymotrypsin inhibitors and trypsin inhibitors and that between trypsin inhibitors and protein content were significant. The high resistance to Bruchid and the high trypsin inhibitor content of *V. vexillata* indicate that protease inhibitors promote or a component of the plants' defence mechanism. SD

675

Onigbinde (AO) and Onobun (V). **Effect of pH on some cooking properties of cowpea (*V. unguiculata*).** *Food Chemistry* 47(2); 1993; 125-127

The cook wt. of white cv. of cowpea (*Vigna unguiculata*) which varied significantly attained max. at about 30 min and 40 min at pH 12, pH 7 respectively and min. at boiling temp at pH 2. The intensity of browning, which increased significantly after boiling with 2 peaks at pH 5-6 and pH 9-10 respectively, reached max. at pH 10-12 in raw beans. Use of alkaline pH is suggested to alleviate the problem of storage induced hardness-to-cook and dehulling to reduce the associated browning. SD

676

Glami (SY). **Effect of processing on the proximate composition and functional properties of cowpea (*Vigna unguiculata*) flour.** *Food Chemistry* 47(2); 1993; 153-158

Protein solubility, water and fat absorption, bulk density, foam capacity and stability of raw, germinated, fermented and heat-treated cowpea flours were analysed. Germination increased crude protein, Fe and total P but decreased carbohydrate, fat and total polyphenol content. pH dependent protein solubility was min. at pH 4.0. Germinated flour recorded max. protein solubility, 0.39 mg/ml and excellent fat absorption. Heat treated cowpea flour showed significantly higher water absorption than raw, germinated or fermented samples. Bulk densities of germinated and fermented flours were reduced by 70.6 and 35.3% respectively. Raw flour gave more stable foam than processed samples. NaCl upto 0.2 m improved foam capacity of raw and processed flours. Raw cowpea flour having better water and fat absorption than raw winged bean or soy flour, may find useful application in bakery products and ground meat formulations. SD

Horsegram

677

Sudha (N), Mushtari Begum (J), Vijayalakshmi (D) and Annapurna (ML). **Protein quality and utilization of horsegram in selected products.** *Beverage and Food World* 21(1); 1994; 23, 24

Sensory quality of *dhokla*, papad and cookies prepared by incorporating horsegram (50%) evaluated. The mean score of control products with respect to appearance was higher than the test products except for *dhokla* where the test and control product had a similar mean score of 4.6. Texture, flavour and overall acceptability of test products were better than the control except for cookies. Study concludes

that horsegram, a less expensive pulse can be used in variety of products and germination of whole grain enhances the protein quality. SRA

Mung beans

678

Saxena (S) and Bhattacharya (L). **Proximate composition of improved varieties of mung bean.** *Bulletin of Grain Technology* 31(1); 1993; 41-43

Five improved var. of mungbean (*Vigna radiata* L.) viz., PM 1, PM 2, PM 3, K 851 and UPM 83-8 were analysed for moisture content, total ash, crude fibre, crude protein, crude fat, carbohydrate and energy content. The moisture ranged from 11.16 to 12.31%, total ash 3.46 to 4.73%, crude fibre 5.15 to 6.06%, crude protein 18.05 to 23.69%, crude fat 1.07 to 1.70%, carbohydrate 65.02 to 72.06% and energy 362 to 371 kcal. UPM 83-8 appeared to be a promising var. AA

Peas

679

Bishnoi (S) and Khetarpaul (N). **Effect of domestic processing and cooking methods on in-vitro starch digestibility of different pea cultivars (*Pisum sativum*).** *Lebensmittel-Wissenschaft und - Technologie* 47(2); 1993; 177-182

Vegetable (Bonneville and Arkel) and field peas (HFP4 and Rachna) showed significant varietal differences in starch digestibility (*in vitro*) reducing sugars, non-reducing sugars and starch. Soaking for 6, 12 and 18 h; soaking (12 h) followed by dehulling; ordinary and pressure cooking of unsoaked, soaked and soaked-dehulled seeds; and sprouting for 12, 24 and 48 h brought significant increase in starch digestibility. Cooking (gelatinising starch) and sprouting (mobilising starch) improved starch digestibility by pancreatic amylase. Pressure cooking was most effective followed by ordinary cooking, sprouting, dehulling and soaking. SD

680

Bishnoi (S) and Khetarpaul (N). **Saponin content and trypsin inhibitor of pea cultivars. Effect of domestic processing and cooking methods.** *Journal of Food Science and Technology (India)* 31(1); 1994; 73-76

Field and vegetable cvs (Bonneville and Arkel) of peas contained saponins in the range of 109-251 mg/100 g and trypsin inhibitors 922-989 TIU/g. Sprouting, soaking, soaking + dehulling, pressure cooking of unsoaked/soaked-dehulled peas significantly ($P < 0.05$) reduced the antinutrients. Pressure cooking of soaked-dehulled pea reduced trypsin inhibitors by 90-95% and germination for 48 h lowered saponin content by 67 - 84%. SD

OILSEEDS AND NUTS

Groundnuts

681

Malundo (TMM) and Resurreccion (AVA). **Optimization of liquid whitener from peanut extract.** *Lebensmittel-Wissenschaft und - Technologie* 26(6); 1993; 552-557

Proportions of peanut extract, cottonseed oil, and water in liquid whitener were optimized. 84 consumers rated the performance and sensory characteristics of a commercial control and 12 whitener blends containing varying proportions of extract, oil, and water. Solubility, whitening power, colour uniformity, and appearance acceptability of blends containing 0.533, 0.367, or 0.200 peanut extract and no oil were not significantly different from the control. The control had flavour acceptability significantly higher than all experimental blends and overall acceptability not significantly different from a blend with 0.367 peanut extract and no oil. Responses of all dependent performance and sensory variables to the component blends studied were predicted by reduced cubic polynomials. Overall acceptability was the limiting response for the optimum product. Use of over 0.50 peanut extract in the blend resulted in unacceptable products. The max. amount of oil in an acceptable formulation was 0.01 of the component blend. This was blended

with 0.20 extract. Acceptable oil levels decreased with increasing extract levels. Optimum formulations had consumer ratings of at least 7.5, 6.0 and 6.5 for solubility, whitening power, and colour uniformity respectively. AA

682

Begum (M) and Majumder (SK). **Incidence of groundnut mycroflora under different drying conditions with reference to oil quality.** *Bulletin of Grain Technology* 31(1); 1993; 58-60

Groundnut pods with 34% moisture content (MC) were subjected to (i) sundrying, (ii) shade drying and (iii) oven drying. Rapid decrease in MC was observed in (iii). There was no aflatoxin content in (i) and (iii) but (ii) recorded 11.11 p.p.b. MC below 10% could ensure quality of the groundnut oil. GS

683

Bankole (SA) and Adebajo (LO). **Effect of relative humidity during storage on the shelf life of Nigerian groundnut cake snacks.** *Die Nahrung* 37(2); 1993; 177-178

Groundnut snacks stored at 80% RH and above had mould growth within 7 days of storage whereas those stored at 72.5% RH were free of visible mould growth up to 2 wks after storage. Mouldiness was not detected in snacks stored at 62% RH and below throughout the period of storage. After 3 wks in storage, the surface of the snacks stored at 91% and 100% RH were ramified by the mycelia of the different mould species and the individual snacks were indistinguishable. The snacks stored at 62% RH and below still retained their normal colour throughout the storage period and the odours and tastes of snacks stored at these RH were as good as freshly prepared snacks. Based on the results obtained the groundnut cake snacks of low moisture content should be kept in a dry atm. at 62% RH or lower to prevent their rapid deterioration, due to mould. BV

Soybeans

684

Kitamura (K). **Breeding trials for improving the food-processing quality of soybeans.** *Trends in Food Science and Technology* 4(3); 1993; 64-67

The use of breeding techniques to alter the seed protein composition and flavour of soybeans; development of new soybean var. with improved processing characteristics; and elimination of seed lipoxygenase isoenzymes are the aspects reviewed. GS

685

Sharma (YK) and Subramanian (N). **Comparative studies on functional properties of soymeals from 'Kalitur' and 'Bragg' varieties.** *Journal of Food Science and Technology (India)* 31(1); 1994; 27-31

'Kalitur' (black) soybean var. was evaluated and compared with 'Bragg' var. for the functional properties of their meals. Water absorption capacities were 217 and 237 g/100 g of 'Kalitur' meal proteins and its heat processed meal, respectively. Fat absorption capacities were 112 and 141 g oil/100 g 'kalitur' and its heat processed meal, respectively. Foaming and emulsification capacities were min. at pH 4.5 and higher at alkaline and highly acidic pH. Foam stability increased with increase in concn. upto 0.4 M NaCl and then started decreasing. The data indicate high potential of 'kalitur' meal protein for application in food system. AA

686

Klus (K), Borger-Papendrof (G) and Barz (W). **Formation of 6,7,4'-trihydroxyisoflavone (factor 2) from soybean seed isoflavones by bacteria isolated from tempe.** *Phytochemistry* 34(4); 1993; 979-981

The tempe-producing bacteria *Brevibacterium epidermidis* and *Micrococcus leteus* transformed the soybean isoflavone glycitein to 6,7,4'-trihydrooxyisoflavone (factor 2). A third tempe-producing bacterium, *Microbacterium oborescens*, converted the soybean isoflavone daidzein to factor 2 and glycitein. The products of these transformation reactions were elucidated by spectroscopic techniques. AA

Soy products

687

Kanchana (S), Neelakantan (S) and Banumathi (P). **Studies on the formulation of high protein snack foods using soybeans. II. Savouries.** *Indian Journal of Nutrition and Dietetics* 27(8); 1990; 243-249

Soybean and soydhal were soaked in tap water at room temp. for different periods of time viz. 30, 60, 120 and 180 min followed by deep frying of soybean (3, 5 and 7 min) and soydhal (2, 4 and 6 min) in refined sunflower oil at 200°C. Salt and chilli powder were added (1%). Storage studies were conducted by storing items in 4 different containers: (i) kraft paper bag (ii) wax paper bag (iii) polyethylene bag and (iv) glass bottles for a period of 4 wk at room temp. (28 - 34°C and rh 54-65%). The moisture content was determined once in 4 days throughout the storage period. Moisture content increased with the soaking period. The protein content of both soybean and soydhal savouries was around 41 g % per 100g for all the frying periods. Frying of the bean or dhal exerted a greater influence on the destruction of trypsin inhibitor activity than soaking. For soybean savoury, soaking for 120 min followed by deep frying for 7 min was optimum. For soydhal savoury, soaking for 60 min followed by 4 min of frying was found to be optimum. The snacks could be kept for a period of 28 days in air tight containers and for 12 days in flexible packages. GS

Soy flour

688

Bargale (PC) and Griffin (RC). **Studies on modified atmospheric packaging of full fat soyflour.** *Indian Journal of Nutrition and Dietetics* 28(4); 1991; 118-121

Full-fat soy flour (FFSF) treated with inert N and packed in LDPE pouches and laminated Al. foil were stored at (i) low temp./ low humidity (25°C/40% RH) and (ii) high temp./high humidity (40°C/90% RH). Results indicate treated FFSF could be stored for 60 days. BV

Soy milk

689

Nayak (RR). **Preparation of *shrikhand* using soymilk.** *Beverage and Food World* 21(1); 1994; 30, 31

This paper briefly discusses the attempt made to prepare *shrikhand* using soybean and soy milk (SM). The method of preparing SM, soy curd by lactic fermentation with *dahi*, preparing *shrikhand* from soy chakka and various parameters involved in the manufacture of soy *shrikhand* are described. SM boiled, cooled to 30°C, 3% w/w glucose was added and fermented with 7-10% w/w dahi. *Shrikhand* was prepared by adding equal amounts of sugar and chakka (w/w), colours and flavours and analysed for microbiological and sensory quality. Results showed that the optimum fermentation time of soy curd was 12 h with curd level having pH 4.06, acidity 1.30% as lactic acid. Soy curd thus obtained had beany flavour. Addition of flavour and colour masked this flavour, and made the product more tasteful. Various combination of cardamom gave excellent organoleptic quality, and the product could be stored at 15°C for more than 4 wks. SRA

Soy proteins

690

Horvatic (M) and Gruner (M). **Effect of gamma-irradiation on methionine and tryptophan content in soya protein products.** *Die Nahrung* 37(2); 1993; 147-152 (De)

Irradiation with doses of 1, 3 and 5 kGy caused significant ($p = 0.05$) decrease of methionine contents in soy protein products. Parallel with the decrease in methionine also the relative quality of proteins is lowered. Tryptophan content were significantly reduced ($p = 0.05$) at irradiation doses of 3 and 5 kGy. The relative decrease of methionine and tryptophan contents are significantly correlated ($p = 0.05$) with relative increase in amount of products by the irradiation induced oxidation of lipids; correlation coeff. were 0.576 and 0.715. BV

Soyflakes

691

Bargale (PC), Joshi (KC) and Jha (K). **Studies on keeping quality of soyflakes in different packaging materials under humid condition of storage.** *Bulletin of Grain Technology* 31(1); 1993; 32-37

Efforts were made to enhance the shelf-life of soyflakes (SF) under humid conditions of storage (25°C/80% RH) through use of various packaging materials viz. laminates of polyester/Al. foil/LDPE; Al foil/paper/wax coated paper: paper/Al foil/LDPE and LDPE packs with different gauges. All the laminates could store the flakes for 60 days whereas the LDPE could store it for 15 days only. Although all the laminates were found suitable, the laminate with 12 micron polyster/0.009 mm Al. foil/150 ga. LDPE may be preferred over others for short-term storage of SF under humid conditions. AA

Sunflower

692

Raymond (J), Rakariyatham (N) and Azanza (JL). **Purification and some properties of polyphenol oxidase from sunflower seeds.** *Phytochemistry* 34(4); 1993; 927-931

The polyphenoloxidase from *Hellanthus annuus* was purified by a combination of SP-Sephadex G-50 chromatography. DEAE-cellulose chromatography, Sephadex G-150 gel filtration and Concanavalin-A-Sepharose chromatography. The final product gave a single band on PAGE. The enzyme purification factor was 149 with a 5% recovery and a carbohydrate content of 6.7%. The partially purified enzyme exhibited the pH optimum at pH 7.9 with gallic acid as substrate and a good stability in the pH range 4.8-7.9 and below 45°C. The enzyme showed activity towards σ-diphenols with no detectable monophenolase activity: the K_m value for gallic acid was 1.11 mm. It was characterized by response to various inhibitors. L-Cysteine, β-mercaptoethanol, sodium metabisulphite, dithiothreitol and phenyl hydrazine inhibited strongly. Purified PPO is a monomeric enzyme and has a M_r ca 42000 on SDS-PAGE. AA

Carrots

693

Nyman (M), Nylander (T) and Asp (NG). **Degradation of water-soluble fibre polysaccharides in carrots after different types of processing.** *Food Chemistry* 47(2); 1993; 169-176

Frozen, blanched, boiled, microwaved and canned carrots were studied. Mol. wt. of frozen and blanched carrots was comparable. Boiled, microwaved and canned showed increase in both high mol. and low mol. wt. fractions of soluble polysaccharides (especially pectic substances) isolated after digestion of protein and starch indicating solubilization of originally insoluble material as well as a degradation of the soluble high mol. wt. material. But in the polysaccharide fraction isolated directly without any degradation of protein and starch, there was an increase only in the low mol. wt. fraction and only when the materials were microwaved and canned. The viscosity of polysaccharides isolated without degradation of protein and starch correlated with the extent of degradation of polysaccharides. With all the treatments the viscosity of soluble fibre isolated after degradation of protein and starch was similar. SD

Sugar beet

694

Dongowski (G). **Isolation of dietary fiber preparations from extracted sugar beet pulp.** *Die Nahrung* 37(4); 1993; 364-373 (De)

The preparation of dietary fiber from extracted sugar beet pulp by treatment with peracetic acid (PAA) was investigated by application of statistical experimental plans of a second order. The influence of reaction temp. and time and of PAA concn. on the amount of alcohol-insoluble substance, the PAA consumption, the content of pectin and protein, the degree of whiteness and the water

binding capacity was determined and discussed for optimization of preparation parameters. A dietary fiber product from sugar beet pulp prepared under optimum conditions has good sensory properties and consists of 56.1% insoluble and 16.1% soluble dietary fiber, 36.7% cellulose, 9.7% hemicellulose-pentoses and 7.1%-hexoses, 16.9% pectin, 11.0% raw protein and 1.1% raw fat. Neutral saccharide residues were 36.1% glucose, 8.1% arabinose, 5.8% galactose, 1.1% rhamnose, 0.7% xylose and < 0.05% mannose. AA

Cassava

Cassava products

695

Essers (SAJA), Bosveld (M), Van der Grift (RM) and Voragen (AGJ). **Studies on the quantification of specific cyanogens in cassava products and introduction of a new chromogen.** *Journal of the Science of Food and Agriculture* 63(3); 1993; 287-296

The enzymic assay for cyanogens in cassava as developed by Cooke (1978) and improved by O'Brien et al (1991), was compared with a standard method, involving autolysis/steam distillation/titration, and further improved with a more acceptable coloration and other minor changes. Cooke's assay, using a linamarin calibration curve, gave similar values for cyanogenic potential in fresh cassava as the standard method. For cassava samples with high non-glycosidic cyanogen levels, Cooke's assay yielded slightly lower values. Isonicotinate/1,3-dimethyl barbiturate as reagent in the Konig reaction had the following advantages compared with the so far applied pyridine/pyrazolone colour reagent. It is less toxic and does not release repulsive vapours. It is faster, cheaper and easier to handle, and has increased sensitivity and longer storability. Direct measurement of cyanogenic potential was accurate in extracts containing 35-700 µm. Recovery of linamarin supplements was 102 plus or minus 4%. Separate calibration curves of linamarin, acetone cyanohydrin and KCN were necessary for accurate calculation of cyanogenic glycosides and cyanohydrin levels. Extract storability depended slightly on storage temp., but was not changed by inclusion of ethanol in the extract medium. AA

Potatoes

696

Simal (S), Berna (A), Mulet (A) and Rossello (C). **A method for the calculation of the heat transfer coefficient in potato drying.** *Journal of the Science of Food and Agriculture* 63(3); 1993; 365-367

A method for the detn. of the heat transfer coeff. was proposed for the first falling drying period of potato cubes. During this period, heat and mass transfer were considered as coupled phenomena. Temp. calculation inside the sample was performed using the macroscopic heat transfer balance. The heat transfer coeff. was computed by means of parameteric identification, using the Gauss-Newton method. The figure obtained for the heat transfer coeff. shows good agreement with other sources. AA

Sweet potatoes

697

Jyh-Bin Sun, Severson (RF) and Kays (SJ). **Quantitative technique for measuring volatile components of baked sweet potatoes.** *Hortscience* 28(11); 1993; 1110-1113

Volatiles formed during baking 'Jewel; and 'Centennial' sweet potatoes at 204°C were purged with He or HeO_2 mixture, collected in cold methylene chloride, and reduced in vol. Volatile components were quantified. Quantitatively, the major components were 2-furaldehyde; 2-furanmethanol; benzaldehyde; 5-methyl (2-furfural; phenylacetaldehyde; 3-hydroxy-2-methyl-4H-pyran-4-one; 2, 3-dihydro-3, 5-dihydroxy-6-methyl-4H-pyran-4-one and 5-hydroxy- methyl-2-furancarboxaldehyde. SRA

Vegetables

698

Ghafoorunissa and Pangrekar (J). **Vegetables as sources of α-linolenic acid in Indian diets.** *Food Chemistry* 47(2); 1993; 121-124

Total lipids were extracted from fresh vegetables, legumes (dry beans) and fenugreek seeds and the fatty acid compositions were determined. The dry beans and fenugreek seeds contain high amounts of both linoleic and α-linolenic acids. Rajmah and cowpea provide more α-linolenic acid as compared to Bengal gram and peas (linoleic/α-linolenic ratio less than or equal to 1.7 and 5.0 respectively). Fenugreek seeds contain -25 α-linolenic acid. On an av. the green leafy vegetables provide about 7 time more α-linolenic acid than fresh beans and other vegetables. In cereal pulse-based lacto-vegetarian diets, inclusion of plant foods rich in α-linolenic acid on a regular basis can make important contributions to the intake of n-3 fatty acids and may ensure a better nutritional status of these fatty acids. AA

Bitter gourd

699

Kalpana Platel (ShurpalekarKS) and Srinivasan (K). **Influence of bitter gourd (*Momordica charantia*) on growth and blood constituents in albino rats.** *Die Nahrung* 37(2); 1993; 156-160

Feeding of bitter gourd (*M. charantia*) at 0.02, 0.1 and 0.5% (dry wt.) levels in a semi-synthetic diet for a period of 8 wks did not have any adverse influence on the food intake, growth and organ wts. of normal adult rats. The haematological parameters of these experimental rats were also normal. Serum cholesterol levels of the rats receiving 0.5% bitter gourd were significantly lower than those of the control rats. There was no hypoglycaemic effect of bitter gourd in these normoglycaemic rats. AA

Carrots

700

Abdelrahim (KA), Ramaswamy (HS), Marcotte (M) and Toupin (C). **Mathematical characterization of residence time distribution curves of carrot cubes in a pilot scale aseptic processing system.** *Lebensmittel-Wissenschaft und - Technologie* 26(6); 1993; 498-504

Residence time distribution (RTD) of food particles and carrier fluid was evaluated in a commercial pilot scale aseptic processing system using a full factorial design of experiments employing flow rate (15 and 20 kg/min), temp. (80 and 100°C), holding tube length (1.5, 17.5 and 26.7 m) particle (carrot cubes) size (6 and 13 mm) and starch concn. (30 and 50 g/kg) of the carrier fluid as factors. RTD curves of carrot cubes were characterized in this study using a special case of the logistic model (autocatalytic or inverse exponential model). Three model parameters (an accumulation rate factor), B, a concn. limit factor, U and a half-time factor, M fully described the RTD curve: $F = C/[1 + e^{-B(\theta-M)}]$. The model was used to describe the influence of various process parameters and to obtain E-type RTD curves. All test factors were significant ($P < 0.05$) in influencing the parameters associated with the logistic model. Using multiple regression, the logistic parameters were related to the experimental factors ($R^2 > 0.78$). AA

FRUITS

Apples

701

Shalon (NB), Hanzon (J), Klein (JD) and Lurie (S). **A postharvest heat treatment inhibits cell wall degradation in apples during storage.** *Phytochemistry* 34(4); 1993; 955-958

Changes in pectic fractions occurring during storage of heated and non-heated apple fruit (*Malus domestica* cv Golden delicious) and the correlation with fruit softening during storage were studied. Pre storage heating (38 for 4 days) of apples lead to enhanced retention of fruit firmness during storage and post storage ripening. Softening of the fruits during storage at 0°C was accompained by an increase in H_2O-

and CDTA (trans-1,2-diaminocyclohexane-N,N,N',N'-tetracetic acid soluble pectin), a decrease in uronic acid content in Na_2CO_3-soluble pectin and no change in the uronic acid present in the insoluble fraction of the cell wall. These changes did not occur in heated fruit during storage. Decrease in arabinose during fruit heating was from pectic fractions while galactose decreased in both pectic fractions and the insoluble residue. GS

Blueberries

702

Kader (F), Rovel (B) and Metche (M). **Role of invertase in sugar content in highbush blueberries (*Vaccinium corymbosum* L.).** *Lebensmittel-Wissenschaft und - Technologie* 26(6); 1993; 593-595

Six batches of ripe blueberries (*V. corymbosum* L.) were analysed for sugar content. Glucose and fructose were found to be the predominant sugars, and were present in approx. equal proportion (glucose:fructose ratio of about 1). Distinct differences were observed between the sucrose concn. of all batches; the proportion of sucrose present ranged between 1.6 and 14.6 g/100 g of total sugar. No sucrose synthetase and sucrose phosphate synthetase activity was detected in any of the batches, but each batch exhibited an invertase activity. This appeared to be inversely proportional to sucrose concn. Variations in sucrose concn. were attributed to the action of the enzyme, and invertase activity was closely correlated with sucrose content. The optimum temp. for this enzyme was 60°C. Invertase can modify the sugar profile and affect the flavour of end products. Temp. control is suggested as a method to inactivate invertase, to prevent all modifications. AA

Guavas

703

Gulati (T), Sadana (B) and Nagi (M). **Development and acceptability of guava products.** *Beverage and Food World* 21(1); 1994; 28-29

Products such as *murabba* (GM), milk shake (GMS), chutney (GC), pickle (GP), raita (GR) made from guava was evaluated for organoleptic quality. Evaluation showed that GM obtained max. scores for appearance, colour, texture and overall acceptability followed by GMS and GC respectively. Mean scores for overall acceptability varied from 6.18 plus or minus 0.58 (GP and GR) to 6.66 plus or minus 0.62 (GM). GM contained max. ascorbic acid of 160 mg/100 g followed by GP 118 mg/100 g on fresh wt. basis. GMS and GR had the lowest values of vitamin C. SRA

Lemon

704

Teotia (MS), Saxena (AK), Berry (SK) and Sehgal (RC). **Studies on steeping preservation and utilization of galgal.** *Beverage and Food World* 21(1); 1994; 44-45

Galgal fruits were preserved (steeping preservation technique) using steeping sol. containing 0.07% potassium metabisulphite, 2.5% common salt and 0.2% acetic acid. The fruits kept well in the sol. for 8 months. Preserved fruits were made into excellent quality pickles and sliced fruits were candied in sugar syrup which had acceptable sensory appeal with chewy texture and sweet and sour taste. SRA

Lemons

705

Khurdiya (DS). **Home-scale processing of lime syrup and pickle.** *Indian Horticulture* 38(4); 1994; 18-19

Lime fruits are washed, cut into halves and squeezed to obtain juice. Sugar (65%), potassium metabisulphite (700 p.p.m.) as preservative are added, heated to boiling temp., filtered, cooled and stored in cool and dry place. After 15 days this syrup could be diluted with 5 parts of water for a ready to serve drink. Lime peel, after the seeds are separated, cut into quarter, mixed with common salt (20%) and kept in glass jars for a wk in sunlight. Alternatively this is pressure cooked, mixed with roasted and powdered spices for pickle preparation. SRA

Mandarins

706

Lotha (RE), Khurdiya (DS) and Maheshwari (ML). **Effect of storage on the quality of Kinnow mandarin fruit for processing.** *Indian Food Packer* 48(2); 1994; 25-38

Kinnow mandarin was stored at ambient (9-24°C, RH 65-90%), refrigerated temp. (3.3°C, RH 70-80%) and evaluated for its processing quality in terms of physical and chemical characteristics. The economic shelf-life of the fruits based on 10% physiological loss in wt. and spoilage was 22 and 56 days at ambient and refrigerated temp. respectively. The juice yield was in the range of 46.11 - 49.07%. The total soluble solids (TSS), acidity, pectin of pomace and the pectin and oil content of the peel increased at both temp. during storage. TSS, pH, ascorbic acid, pectin, cloud and density of juice from refrigerated stored fruits increased during storage, while acidity, ascorbic acid and viscosity decreased in fruits stored at ambient temp. The sugar contents were not much affected by storage temp. The total carotenoids and Hunter colour decreased at ambient temp. while it increased at refrigerated temp. AA

Mangoes

707

Kaushik (V) and Nath (N). **Standardization of a recipe for a beverage-base from unripe Dushehari mangoes.** *Beverage and Food World* 21(1); 1994; 22, 24

Dushehari mangoes were pulped by cooking whole fruit under steam pressure, peeled, destoned and blended. Beverage containing 16.7% pulp, 1.5% NaCl, 0.2% citric acid, 5.0% sugar and 1.0% spice mix gave the most acceptable product. Beverage base was also prepared using 60.1% pulp, 5.5% NaCl, 0.7% citric acid, 17.6% sugar and 3.7% spice mix. Sensory ratings were the same for beverage prepared either from this base or from the fruit pulp directly. Beverage-base remained acceptable during 120 days storage under ambient conditions. SRA

708

Doreyappa Gowda (IN) and Ramanjaneya (KH). **Studies on physico-chemical characteristics of some commercial cultivars of mango.** *Indian Food Packer* 48(2); 1994; 45-49

Physico-chemical characteristics of 11 var. of mango (Alphonso, Banganapalli, Dashehari, Janardhan Pasand, Kesar, Langra, Mulgoa, Padiri, Panakalu, Suvarnarekha and Totapuri) were evaluated. Peel and stone contents were lowest (13.0%) in Suvarnarekha; fibre content was min. (< 0.5%) in Dashehari, and Janardhan Pasand; TSS of about 19°Brix in Mulgoa, Dashehari, Langra and Alphonso; lowest acidity (0.15%) in Dashehari; max. carotenoids (11536 µg/100 g) in Alphonso; and very high vitamin C content (136.50 mg) in Langra. The pulp of Totapuri, Langra, Mulgoa, Dashehari and Alphonso was very viscous (> 7000 cps) due to higher TSS. GS

709

Khan (AA) and Robinson (DS). **The thermostability of purified mango isoperoxidases.** *Food Chemistry* 47(1); 1993; 53-59

Samll amounts of purified mango (var. *Chaunsa*) anionic and cationic isoperoxidases were obtained by ion-exchange chromatography. Peroxidase activity present in crude extract of mango pulp is shown to be less stable to heat than the enzyme activity of highly purified individual mango isoperoxidases for which heat-inactivation is still non-linear. This may be due to microhetrogeneity in covalently bound oligosaccharide residues at the molecular level. Isoperoxidase activity did not regenerate after heat treatment of crude mango extracts or purified isoenzymes. SD

Melons

710

Moshonas (MG), Shaw (PE), Baldwin (EA) and Yuen (W). **Volatile and non-volatile components in hami melon (*Cucumis melo* L.).** *Lebensmittel-Wissenschaft und - Technologie* 26(6); 1993; 577-589

Hami melon (*Cucumis melo* L. var. Winchosen) flesh was extracted and the extract analysed by

GC-MS, resulting in identification of 42 volatile components. Twenty-four components were newly reported in *Cucumis melo*, including a series of 4 diacetate esters. Non-volatile components quantified in Hami melon flesh include fructose, glucose, sucrose and ascorbic acid. AA

711

Adebajo (LO). **The microbial spoilage of 'soft' melon ball snack under tropical conditions.** *Die Nahrung* 37(4); 1993; 328-335

Nineteen pathogenic and spoilage microorganisms, were isolated from 'soft' melon ball snack samples in the humid Western Nigeria. Physical biodeterioration was recorded from the 6th day of storage with the early occurring rope (slime) of *Bacillus* sp. All the 14 isolated fungi grew though, to varying extents on the snack agar and in the melon seeds infusion medium in which they also induced significant changes in the oil (decrease) and free fatty acids (increase) contents after 10 days of incubation at 30°C. The results indicated *Rhizopus arrhizus*, *R. nigricans*, *Aspergillus flavus*, *A. ochraceus*, *A. tamarii*, *A. niger*, *Mucor fragilis* and *Penicillium citrinum* as the major fungal deteriogens. Isolation of *Escherichia coli* suggested the need for a more hygienic handling of the snack. Addition of breadfruit nuts mash (20%) as adjunct to melon seeds mash to enhance mastication of the snacks with lower moisture content recorded mean acceptability rating of 178 and keeping quality of 10 days while 200 and 5 days were obtained respectively for the control. BV

Papayas

712

Fayyaz (A), Asbi (BA), Ghazali (HM), Cheman (YB) and Jinap (S). **Pectinesterase extraction from papaya.** *Food Chemistry* 47(2); 1993; 183-185

Inactivation time, pH and NaCl influenced the extraction process of pectinesterase (EC.3.1.1.11) from papaya fruit (*Carica papaya* L.) 2 m NaCl sol., pH 8 and 5 h incubation time resulted in max. activity of 6.98 units/min. ml. SD

CONFECTIONERY, STARCH AND SUGAR

713

Kasapis (S). **A study on the unusual spectroscopic behaviour of the *Rhizobium* capsular polysaccharide system.** *Lebensmittel-Wissenschaft und - Technologie* 26(6); 1993; 572-576

When changes in molecular organization of the capsular polysaccharide of *Rhizobium trifolii* (strain TA-1) are monitored by the standard technique of optical rotation (OR), a particularly strange phenomenon is observed. The OR change, during heating (to melt the gel network), continues initially in the same direction as the change observed on cooling (negative contribution), and is then followed by the expected reversal of sign (positive contribution), giving rise to an anomalous dip in the OR-temp. profile. This unusual feature is absent in the temp. dependence of optical rotation on heating at concn. below about 5.5 mg/mL and reaches its max. depth at the highest concn. used (16 mg/mL). As a result, the change in specific rotation decreases by about a factor of 4 between 0.1 and 16 mg/mL but the accompanying enthalpy change shows no evidence of a reduction in the extent of conformational ordering at higher concn. However, rapid decrease of temp. for the *Rhizobium* samples produces a large positive shift in OR, suggesting an antogonism between network formation (negative contribution), which is favoured by slow cooling rates, and chiral structures of competing optical activity (positive contribution) which are more effective on rapid cooling. The chiral aggregates, entrapped within the network, are also responsible for positive differential scattering as detected by circular dichroism. AA

Confectionery

Sweets

714

Yella Reddy (S) and Prabhakar (JV). **Effect of ingredients and processing conditions on fat absorption and texture of *Mysore pak*.**

Journal of Food Science and Technology (India)
31(1); 1994; 44-48

The effects of process parameters and functional properties of the ingredients on fat absorption and texture of *Mysorepak* were studied. The results revealed that the processing condition, such as syrup strength, mixing time and temp. of the fat have considerable influence on fat absorption and texture of *Mysorepak*. The type of fat suitable to impart the desirable texture was found to be a mixture of hydrogenated fat and liquid oil. The fat absorption by cereal flours, such as *maida*, rice and corn starch, was found to be less than that of *besan* (Bengalgram flour). Rice flour and corn starch were not well suited for the preparation of *Mysorepak*. Refined wheat flour could be used in the preparation, but it imparted harder texture. The hardness of the product was found to be inversely proportional to the qantity of fat in the product. *Mysorepak*, having a wide range of textural properties (hardness), could be prepared by altering process parameters and relative proportions of the ingredients. The product formulation and process parameters to obtain *Mysorepak* having uniform texture and fat content, have been specified. AA

Starch

715
Gibson (TS), Kaldor (CJ) and McCleary (BV). **Collaborative evaluation of an enzymatic starch damage assay kit and comparison with other methods.** *Cereal Chemistry* 70(1); 1993; 47-51

A commercially available enzymatic assay kit for the measurement of starch damage in wheat flour was compared with current standard methods, and the kit's precision and repeatability were determined in a collaborative study. Starch damage values determined on a range of flours with the assay kit correlated well ($r > 0.96$) with those determined by existing standard enzymatic methods. The precision of the kit was evaluated in a comprehensive interlaboratory study. The kit procedure was found to be highly repeatable (relative standard deviation, 2.94 - 6.80%) and reproducible (relative standard deviation, 5.00 - 10.30%). AA

Sugars

716
Toufeili (I) and Dziedzic (S). **Synthesis and taste properties of maltose and maltitol analogues.** *Food Chemistry* 47(1); 1993; 17-22

The hypothesis that intramolecular hydrogen bonding is responsible for the sweetness of maltitol is tested by the synthesis of maltitol analogues which differ in configuration at C'_3 and C'_4 and sensory evaluation of the products. 3-*Allomaltitol* and *galactomaltitol* were synthesised by treating suitably protected methanesulphonylated derivatives of benzyl β-maltoside with sodium benzoate followed by removal of the blocking groups and subsequent reduction with sodium borohydride. Sensory evaluation of maltose, maltitol and their analogues revealed that the non-reducing end is involved in the generation of the sweet response and that intramolecular hydrogen bonding governs the accession of this class of polyol sweeteners to the receptor site on the tongue. AA

BAKERY PRODUCTS

717
Neyreneuf (O) and Delpuech (B). **Freezing experiments on yeasted dough slabs. Effects of cryogenic temperature on the baking performance.** *Cereal Chemistry* 70(1); 1993; 109-111

Yeasted dough slabs were frozen under very controlled and different cooling velocities (conventional mechanical refrigeration at -40°C, used as a reference, and cryogenics from -40 to -120°C). Cooling velocity at the core of the dough slabs was about 7 times higher with cryogenics at -120°C than with blast-freezer treatment at -40°C. Throughout 3 months of storage, the baking performance of dough slabs was not affected by the -40 and -60°C cryogenic treatments, whereas decreasing the freezing temp. successively to -80, -100 and -120°C involved a gradual drop in bread vol. (about 15% per operation). Freezing at -60°C yielded the best results in terms of quality (bread vol.) and productivity (freezing time). Cryogenics in

closely controlled conditions should permit a gain in productivity without affecting baking performance. AA

718

Vijaya Rao (D), Radhakrishna (K), Jayathilakan (K), Vasundhara (TS), Bhagirathi (B), Gopal Rao (KR), Srihari (KA), Siddalingaswamy (A). **Manufacture of freeze dried breakfast and dessert foods.** *Journal of Food Science and Technology (India)* 31(1); 1994; 40-43

Quickly rehydratable and nutritious breakfast and dessert foods have been developed using freeze-drying. The freeze-dried wheat porridge (*dalia*), rice pudding (*kheer*) and vanilla custard contained 11.2-12.2% protein and provided 428, 447 and 403 Kcal/100 g, respectively. These are also rich in Ca^{+2} and P^{-5} (306 to 325 mg/100 g and 316.8 to 385 mg/100 g, respectively). These were stable for 6-9 months at 37°C, when packed in paperfoil-polythene-laminate flexible pouches. They exhibited a rehydration ratio of 1:3. *Dalia* and *kheer* could be rehydrated satisfactorily at 45°C, 70°C and in boiling water in 20, 10 and 5 min, respectively. Custard could be instantly rehydrated at 5°C and 45°C or at higher temp., if required. AA

Bread

719

Fadel (HHM) and Hegazy (NA). **Improvement and stabilization of white bread flavour.** *Die Nahrung* 37(4); 1993; 386-394

The results showed that the model system mixture (D,L-lysine - HCl, L-proline and D-glucose) improved the crust colour and flavour of fresh bread and kept the freshness, retarded the staling and improved the quality of the bread samples stored for 3 days. Analysis of the crust aroma of the bread samples showed that 2-acetyl pyrazine, 2-acetyl pyridine and 2-methyl-3-ethyl pyrazine, which may be responsible for bread crust aroma, were determined at high concn. in the bread sample containing 0.24% model system mixture. The concn. of pyrazine derivatives increased during storage whereas the carbonyl, pyrrol and furan derivatives decreased. BV

720

Srivastava (AK), Patel (VR) and Haridas Rao (P). **Effect of common salt substitution on the dough characteristics and bread quality.** *Journal of Food Science and Technology (India)* 31(10; 1994; 15-18

Effect of substituting common salt (NaCl) with *sendha* (rock salt) or low sodium containing salt mixtures on the quality of wheat flour dough and bread was studied. In general, the common salt substitutes reduced water absorption capacity, but increased dough development time, stability, extensibility, resistance to extension and stiffness of the dough. The extent of changes with different common salt substitutes was almost similar and comparable to the dough made with common salt. Incorporation of common salt substitutes improved the loaf vol., crust colour, and crumb characteristics of the bread to the same extent as the common salt. However, only *sendha* yielded bread which had comparable taste and overall quality to that made with common salt. AA

Cakes

721

Lee (CC), Love (JA) and Jhonson (LA). **Sensory and physical properties of cakes with bovine plasma products substituted for egg.** *Cereal Chemistry* 70(1); 1993; 18-21

Dried egg whites were replaced by dried bovine plasma (BP) in high-ratio, white layer cakes at 5 different levels (0, 25, 50, 75 and 100%). Egg whites could be replaced by dried BP without reducing cake vol. Cake symmetry was altered by substituting BP for 75 or 100% of the egg. Substitution altered the colours of both BP and crumb. Cakes with BP replacing 25% of the egg had decreased L and θ values compared with those of the control cakes. Cakes with plasma replacing egg were softer, more moist and gummy, and slightly sweeter than the controls. A blend of hydrolyzed plasma and beef stock could replace 50% of the egg in devil's food cake without affecting symmetry or shrinkage and with only a slight decrease in vol. Consumer panels indicated that cakes made with BP

products were as well liked as the control cakes. BV

Macaroni

722
Ayranci (G) and Kaya (S). **Kinetic analysis of the loss of some B-vitamins during the cooking of macaroni.** *Die Nahrung* 37(2); 1993; 153-155

The kinetics of the losses of thiamin, niacinamide, and riboflavin were investigated during the cooking of macaroni at 50, 75, 80, 85 and 90°C. Simultaneous analysis of the vitamins was achieved by HPLC using a μ-Bondapak column. The activation energies for the losses of thiamin, niacinamide, and riboflavin were determined as 25 kJ/mol, 22 kJ/mol and 11 kJ/mol, respectively. It was concluded that the leaching of these vitamins into cooking water was the main pathway for their loss during macaroni preparation. AA

Melons

723
Ubani (ON), Opadokun (JS), Williams (JO), Akimnusi (A), Akano (DA), Ikeorah (JN). **Storage properties of melon seeds (*Cucumeriopsis edulis*).** *Food Chemistry* 47(1); 1993; 7-10

Unshelled melon seeds (exfiditi Nigeria) fumigated and stored at ambient condition for 10 months in metal drum, plastic bucket, clay pot, polyethylene lined jute bag and ordinary jute bag were evaluated at 3 monthly intervals. Oil content of seeds in all containers increased by 0.37 - 3.03%, protein content by 5.8 - 7.48%, internal mouldiness by 12.4 - 19.4%, external mouldiness by 39-59% and free fatty acid content by 4.23 - 5.57%. No container effect on chemical composition of seeds was apparent. Insect damage was 14% in jute bags after 9 months of storage. Initial germinability of 70% significantly reduced at the end of 10 months, being lowest 8% in clay pot and jute bag. SD

Pasta

724
Lagoudaki (M), Demertzis (PG) and Kontominas (MG). **Moisture adsorption behaviour of pasta products.** *Lebensmittel-Wissenschaft und - Technologie* 26(6); 1993; 512-516

The moisture sorption isotherms of conventional (from 100% durum wheat semolina) and diet (high protein) spaghetti were constructed at 22, 30, 37 and 45°C, using a computerized inverse gas chromatographic method (CIGC). Conventional spaghetti exhibited a higher sorption capacity than diet spaghetti. This is attributed to the higher carbohydrate content of conventional spaghetti as compared to diet spaghetti. Good agreement was observed between moisture sorption isotherms obtained from the CIGC method and the gravimetric static method. BET (Brunauer, Emmett and Teller), GAB (Guggenheim, Anderson and De Boer) and 'Local' isotherm models were tested to fit the experimental sorption data. Goodness to fit, standard deviation and the applicable range of a_w indicated that GAB and 'Local' isotherm models could explain the data well over a wide a_w range upto 0.80. AA

725
D'Egidio (MG), Mariani (BM), Nardi (S) and Novaro (P). **Viscoelastograph measures and total organic matter test: Suitability in evaluating textural characteristics of cooked pasta.** *Cereal Chemistry* 70(1); 1993; 67-72

Two sets of Italian durum wheats were used to make spaghetti: 54 samples dried at low temp. (50°C) and 64 samples dried at high temp. (90°C). Cooking quality was evaluated using sensory judgement (SJ), total organic matter (TOM), and viscoelastograph parameters. SJ was expressed by its components (stickiness, bulkiness, and firmness) and by an overall score. Factor analysis was applied as a clustering tool to assess similar behaviour of variables. Four factors were useful in describing the relationships among variables for each temp. considered. At 50°C the first factor was related to viscoelastograph parameters, the second grouped SJ, stickiness, bulkiness, and TOM, whereas firmness was linked to a different factor. At 90°C firmness was associated with stickiness, bulkiness, and

SJ on the second factor, whereas TOM shifted to another factor. Multiple regressions were calculated to evaluate the relative worths of stickiness, bulkiness, and firmness on SJ and TOM as well as their relationships with viscoelastograph measures when different drying temp. were applied. At low temp., stickiness was the most important SJ component and TOM was a suitable method in estimating SJ. At high temp., firmness played a more important role and viscoelastograph consistency was used to complement the TOM test. AA

Spaghetti

726

Malcolmson (LJ), Matsuo (RR) and Balshaw (R). **Effects of drying temperature and farina blending on spaghetti quality using response surface methodology.** *Cereal Chemistry* 70(1); 1993; 1-7

Five peak drying temp. (40, 60, 70, 80 and 90°C) and 5 blends of farina and durum (0:100, 25:75, 50:50, 75:25 and 100:0) were studied. Good-fit models were developed for compression and relaxation time of optimally cooked spaghetti, for firmness and compression of overcooked spaghetti, and for brightness. Models developed for firmness of optimally cooked spaghetti, relaxation time of overcooked spaghetti, purity and dominant wavelength did not meet all of the criteria of good fit but nevertheless provided useful information for an initial screening study. Models for strand stickiness and cooking loss had low preditive ability. The superimposition of the individual contour plots permitted the identification of the region where all predicted characteristics met or exceeded commercial durum spaghetti samples. The most limiting factors were the firmness of optimally cooked spaghetti, relaxation time of overcooked spaghetti, and dominant wavelength. To satisfy these constraints, durum levels > 60% and peak drying temp. above 60°C were required. BV

Tortillas

727

Torres (PI), Ramirez-Wong (B), Serna-Saldivar (SO) and Rooney (LW). **Effect of sorghum flour addition on the characteristics of wheat flour tortillas.** *Cereal Chemistry* 70(1); 1993; 8-13

Wheat flour tortillas (WFT) were produced from composite flours containing up to 30% decorticated sorghum flour (SF). The L, a and b colour values were not affected by substituting decorticated sorghum for wheat flour. Tortillas containing up to 20% fine flour had sensory properties similar to those of the control tortillas. Coarser SF absorbed less water and produced firmer and less flexible tortillas than did finer flours. The flexibility of fresh tortillas was similar; however, during storage, sorghum tortillas became less rollable, and became so faster, than did WFT. The addition of carboxymethylcellulose to tortillas containing 20% SF significantly decreased staling. Tortillas stored at 25°C staled more quickly than did frozen (-10°C) or refrigerated (5°C) tortillas. Decorticated SF can replace up to 20% wheat flour in hot-press WFT. BV

MILK AND DAIRY PRODUCTS

728

Picon (A), Gaya (P) and Nunez (M). **Quantitative determination of chymosin activity by thrombelastography.** *Food Chemistry* 47(2); 1993; 209-212

The coeff. of detn. between coagulation time and inverse of chymosin concn. in sol. ranged between 0.989 - 0.997 with 0.88% mean coeff. of variation while that between coagulation time and inverse of chymosin present whey ranged between 0.995-0.998 with 0.98% mean coeff. of variation proving the accuracy and objectivity of thrombelastography procedure. SD

Milk

729

Singh (H), Fox (PF) and Cuddigan (M). **Emulsifying properties of protein fractions prepared from heated milk.** *Food Chemistry* 47(1); 1993; 1-6

Heated milk was centrifuged into k-casein/whey protein-rich and k-casein depleted fractions whose emulsifying properties were compared with those of sodium caseinate (SC), whey protein isolate (WPI) and casein micelles. Fat surface areas of both the fractions and casein micelles were similar and considerably lower than that of SC and WPI. Protein load decreased with increased fat surface area and followed the order: casein micelles > k-casein depleted micelles = whey protein/k-casein rich fraction > SC > WPI. Emulsions stabilized by either fraction and by casein micelles were more stable at low fat surface areas. Size of the protein aggregate appears to be more important than their composition in determining emulsifying properties. SD

730
Pande (D) and Mathur (MP). **Age gelation in ultra heat treated milk. Some evidence for a plastein induced mechanism.** *Journal of Food Science and Technology (India)* 31(1); 1994; 77-79

Isolation of protease from whey and its role in age-gelation indicated the plastein induced type of reaction in micellar system. In contrast, casein fractions were completely hydrolysed in nonmicellar system. AA

Milk products

731
Ayranci (E) and Balci (O). **Determination of chloride and nitrate in butter, margarine, cheese and meat products using ion selective electrodes.** *Die Nahrung* 37(4); 1993; 395-398

Chloride analysis was quite easy and salt contents of all butter and margarine samples were found to be < 2 g NaCl/kg while those of cheese and meat products were above 10 g/kg. Nitrate analysis was not as easy as chloride analysis due to interferences of chloride and organic ions. These interferences were tried to be eliminated using either $Al_2(SO_4)_3$ and Ag_2SO_4 sol. or Al and silver resins. Results showed that the elimination of interferences is most effective with the use of resins in amounts of 3 g under the present experimental conditions. Nitrate contents of meat products analysed were found to be < 20 p.p.m. AA

Butter

732
Shive Kumar, Reddy (KV), Sarma (KS), Ranganadham (M) and Padmanabha Reddy (V). **Physico-chemical properties and storage stability of butter incorporated with safflower oil to enhance its polyunsaturated fatty acids.** *Indian Journal of Dairy Science* 46(5); 1993; 211-216

The composition of fresh and stored butter (control) and its blends with safflower oil (SO) (10, 20 and 30%) showed that the fat content of butter and the oil-butter blends were in agreement with PFA standards for table butter. No significant change was observed in the fat content, moisture, curd and salt content throughout the storage period of 40 days. Significant increase in iodine value, spreadability and decrease in hardness of butter was observed in butter samples blended with SO. Sensory evaluation did not show any perceptible difference between control and experimental butters, fresh or stored. Butter blend similar in flavour, body and texture and appearance could be prepared by incorporating SO upto 30%. SRA

733
Desai (NB), Thakar (PN) and Miyani (RV). **Rheological behaviour of commercial table butter in back extrusion test.** *Indian Journal of Dairy Science* 46(4); 1993; 185-186

The results revealed that the product made with continuous churn had relatively higher values for extrusion point and extrusion energy in comparison to the product made by batch method using either top or drum churn, however the differences among the various churns were non-significant. SRA

734
Shivekumar (KV), Reddy (KS), Sarma (KS), Ranganadham (M) and Padmanabha Reddy (V). **Studies on incorporation of safflower oil in butter to enhance its pufa content. Part II.**

Fatty acid profile. *Indian Journal of Dairy Science* 47(8); 1993; 375-376

This paper relates to the fatty acid profile of the oil-butter blends as influenced by the level of oil incorporation. GC analysis of butter blended with 10, 20 and 30% safflower oil revealed that there was a significant increase in the unsaturated fatty acid (USFA) content of butter. Among USFAs the G 18:2 fatty acid increased from 2.13% in control butter to 23.5% in oil butter blend. SRA

Chakka

735

Patel (RS), Kanawjia (SK) and Singh (S). **Effect of various storage temperatures on sensory and chemical characteristics of *chakka*.** *Indian Journal of Dairy Science* 46(4); 1993; 166-170

The keeping quality of *chakka* stored at 5, 10 and 30°C was investigated. The initial flavour score of *chakka* was 51.30. This value decreased with the increased storage period due to deterioration of flavour. The deterioration was faster at 30°C and slower at 5°C. The flavour of *chakka* was acceptable upto 16, 10 and 4 days, stored at 5, 10 and 30°C respectively. The spoiled samples were acidic, sour, yeasty and mouldy. The body texture score was initially 26.10, which decreased with increase in storage period. Max. reduction of score was observed in samples stored at 30°C, and min. reduction was found at 5°C. The colour of *chakka* turned to dull, yellow and the surface became hard and coarse. SRA

Cheese

736

Kanawjia (SK), Nageswara Rao (K), Singh (S) and Latha Sabikhi. **Role of Lactobacilli in cheese - a review.** *Indian Journal of Dairy Science* 46(5); 1993; 187-197

The description of the lactobacilli, their occurrence in milk and cheese, proteolytic and lipolytic systems of lactobacilli, the role of lactobacilli and their enzymes in cheese ripening, the defects or spoilage caused by lactobacilli, and the role of lactobacilli in the accelerated cheese ripening are discussed in this review. 81 references. SRA

737

Joshi (NS), Thakar (PN) and Jana (AH). **Utilization of butter milk in cheese making - a review.** *Indian Food Packer* 48(2); 1994; 59-65

The utilization of butter milk (BM) as a cheaper source of milk solids (MS) non-fat (SNF) in cheese manufacture and the effect of MS on the processing conditions and cheese quality are studied. Effective utilization of MS from BM minimizing waste disposal problem at the creamery, cost saving, increased yield, improved flavour, consistency and biological value and probable hypocholesterolemic effects are the advantages of BM utilization in cheese manufacture. Care should be taken to avoid addition of higher levels of BM in cheese production because it might cause off-flavours and reduce the keeping quality of cheese. GS

Cheddar cheese

738

Joshi (NS) and Thakar (PN). **Utilization of butter milk in manufacture of buffalo milk Cheddar cheese.** *Indian Journal of Dairy Science* 46(8); 1993; 387-392

Casein requirement for standardization of buffalo milk to casein/fat ratio 0.7 was fulfilled by skim-milk (control) and the same was substituted in 25, 50, 75 and 100%, by casein available from butter milk as experimental treatments. Cheddar cheese made from these milks revealed that with increase in proportion of butter-milk in cheese milk, the acidity of milk at rennetting increased. Fat, protein and pH of resultant cheese was reduced. The flavour, texture and body of cheese made by utilizing 25% casein from butter milk to substitute skim-milk casein remained the same as control. During ripening the texture and flavour increased. Products with 75, 100% levels of substitution were unacceptable at 4.5 months of ripening. SRA

Cottage cheese

739

Reykdal (O) and Lee (K). **Validation of chemical measures of calcium with bioassay of calcium fortified cottage cheese.** *Food Chemistry* 47(2); 1993; 195-200

Cheese was fortified at 4 levels of Ca with or without added guar to increase acceptability. Dialyzed and ionic dialyzed Ca test and soluble and ionic soluble Ca test were adopted for digested and non-digested samples. Ca added cheese sample significantly increased % Ca availability from rat diets containing the same cheese with and without guar correlated well with bioassay results. Ionic dialyzed, ionic soluble and soluble Ca correlated with bioassay measures. Ionic dialyzed Ca in non-digested diets was the best chemical test for bioavailability. Digestion did not improve accuracy. SD

Swiss Gruyere cheese

740

Bosset (JO), Collomb (M) and Sieber (R). **The aroma composition of Swiss Gruyere cheese. IV. The acidic volatile components and their changes in content during ripening.** *Lebensmittel-Wissenschaft und - Technologie* 26(6); 1993; 581-592

Part IV first reports a list of acidic volatile components isolated and identified by GC-MSD in a pool of 5 mature, first class Swiss Gruyere cheeses. The analysis of the outer zone (including the smear-coated rind), the middle and central zones revealed concn. gradients for some of the volatile components. The compounds found were principally fatty acids such as ethanoic, butanoic, propanoic, hexanoic, 2- methylbutanoic, 2- methyl propanoic, 3- methylbutanoic, pentanoic, octanoic and decanoic acids ranked by decreasing concn., and hydroxybenzene (phenol). Changes in the content of these acidic volatile substances were then studied in 2 zones of 8 first class Swiss Gruyere cheese over a 12-month ripening period. Quantitative detn. of main constituents were performed separately by GC-TCD for the 8 loaves. Semi-quantitative analyses of minor compounds were carried out by GC-MS or GC-FID only in a pooled sample. The content of 2-methylpropanoic, 2-methylbutanoic, 3-methylbutanoic, 4-methylpropanoic, hexanoic (particularly in the inner zone), octanoic, and decanoic acids as well as hydroxybenzene increased in an approx. exponential way during the ripening period. On the other hand, concn. of total volatile fatty acids, ethanoic, propanoic, butanoic, pentanoic and hexanoic (particularly in the outer zone) showed a more linear increase. Some possible metabolic pathways for the formation of these cheese flavour components are reviewed. AA

Ghee

741

Rajesh Kumar and Lal (D). **Stability of tertiary butyl hydroquinone (TBHQ) in *ghee* during storage.** *Indian Journal of Dairy Science* 46(4); 1993; 171-173

The effect of addition of TBHQ at concn. of 5, 10 and 20 mg/100 g fat to butter on its stability during conversion into *ghee* and also during storage of *ghee* was studied. Stability of TBHQ during clarification of butter into *ghee* at 120°C was relatively higher at higher concn. of added antioxidant, accounting a loss of 6% at 20 mg/100 g level fat compared to 10.8% at 5 mg/100 g level. TBHQ imparted excellent oxidative stability to *ghee* during storage at room temp. SRA

742

Gaihotra (KK) and Wadhwa (BK). **Chemistry of ghee-residue, its significance and utilisation - a review.** *Indian Journal of Dairy Science* 46(4); 1993; 142-146

This review covers the following aspects: yield of ghee; particle size and density; recovery of ghee from ghee residue; composition, lipid fraction of ghee residue (physico-chemical constants, polyunsaturated fatty acids, phospholipids); proteins in ghee residue; milk sugars in ghee-residue; antioxidant properties of ghee-residue (contribution of lipid and non-lipid constituents); nutritive value and utilisation of ghee-residue (preparation of

sweets, source of normal antioxidants and flavour concentrates). 31 references. SRA

Kachcha churpi

743

Pal (PK), Hossain (SKA), Sarkar (PK) and Patil (GR). **Compositional and sensory characteristics of *Kachcha churpi*.** *Journal of Food Science and Technology (India)* 31(1); 1994; 71-72

Kachcha churpi (KC), a traditional milk product, is prepared by coagulating skimmed or partially defatted cow or yak milk. KC prepared from skim milk contained more protein (31.7%) than the products from buttermilk (18.5%) and defatted milk (28.2%). On sensory quality, it was found to be superior to other products, with respect to flavour, body, texture, colour, appearance and overall acceptability. AA

Paneer

744

Johri (SS), Tyagi (SM), Chauhan (GS) and Verma (NS). **Effect of coagulants and fat levels on the quality of *paneer* prepared from cow milk.** *Beverage and Food World* 21(1); 1994; 32, 34, 35

The effect of different levels of fat (0.1 - 4%) in cow milk on *paneer* made by coagulants (1.0% citric acid (CA), 5% $CaCl_2$ calcium lactate (CaL) and calcium acetate (CaA)) was investigated. Max. milk solids could be recovered from *paneer* by coagulating milk at 80°C. The recovery of total milk solids from *paneer* was highest (65.33%) in case of CaA followed by CaL (68.79%), $CaCl_2$ (62.35%) and CA (59.87%). The yield and fat content of *paneer* increased by increasing fat level in milk whereas moisture, protein, ash and carbohydrate content, hardness, cohesiveness, springiness, gumminess an chewiness decreased. Sensory scores increased significantly by increasing fat level in milk. CaA was found to be the best coagulant for preparing *paneer* of acceptable quality from low fat milk. SRA

Yoghurts

745

Jawalekar (SD), Ingle (UM), Waghmare (PS) and Zanjad (PN). **Influence of hydrocolloids on rheological and sensory properties of cow and buffalo milk yoghurt.** *Indian Journal of Dairy Science* 46(5); 1993; 217-219

The effect of various hydrocolloids on the sensory and rheological characteristics of yoghurt prepared from standardized cow milk (4% fat, 8.5% SNF) and buffalo milk (6% fat, 9% SNF), gelatin (0.3%), sodium alginate (1.5%) and starch (1.5%) were studied. Gelatin was found to be the most suitable stabilizer for improving the body and texture of yoghurt with reduced whey separation. Addition of stabilizer's did not have much effect on the colour and flavour scores. Viscosity and curd tension significantly improved using gelatin and to a lesser extent by sodium alginate. Synersis properties of yoghurt prepared from both milks significantly improved by addition of stabilizers. SRA

746

Chawala (AK) and Balachandran (R). **Studies on yoghurt from buffalo milk: Effect of different levels of fat on chemical, rheological and sensory characteristics.** *Indian Journal of Dairy Science* 46(5); 1993; 220-222

Study indicated that higher fat content resulted in superior flavour and appearance of yoghurt, and reduced yoghurt setting time, decreased penetration value but increased viscosity. Body texture score increased upto 4.5% fat level and then decreased. Max. curd tension of 54 g was found in 0.05% fat and min. of 29 g in 1.5% fat. Result also indicated that in case of buffalo milk, 3.0% fat could be adequate for yoghurt making. SRA

Milk proteins

747

Bastier (P), Dumay (E) and Cheftel (JC). **Physico-chemical and functional properties of commercial caseinates.** *Lebensmittel-Wissenschaft und - Technologie* 26(6); 1993; 529-537

The composition, physico-chemical and functional properties of various commercial caseinates were analysed. The protein content was higher, while density and particle size were lower in Ca than in Na, K, Ca/Na or Ca/K caseinates. Ca caseinates had a significantly lower solubility index, water absorption capacity and apparent viscosity than other caseinates. The solubility index at 20 g/L (at both pH 7.0 and spontaneous pH) varied from 0.81 to 0.97 g/g for Ca caseinates, and from 0.89 to 0.99 g/g for Na or K caseinates. The water absorption capacity (Baumann apparatus, 30 min at 20°C) varied from 1.3 to 1.9 mL water/g powder (Ca caseinates) and from 2.1 to 3.2 mL/g (Na or k caseinates). The apparent viscosity at 150 s^{-1} varied from 40 to 1150 mPa.s (Ca caseinates) and from 500 to 3200 mPa.s (Na or K caseinates). For Ca caseinates, variability was observed between different batches from the same manufacturer. However, the Ca content was positively correlated to pH and negatively correlated to solubility index, rate of water absorption and apparent viscosity. These 3 latter properties were positively correlated to each other, but they were modified for mixed caseinates containing Ca plus Na or K. AA

MEAT AND POULTRY

Meat

748

Sahoo (J), Kesava Rao (V), Kowale (BN) and Yadav (PL). **Conversion of keratinous tissue from slaughterhouse by-products to food.** *Beverage and Food World* 21(1); 1994; 25-26

This review article covers amino acid composition of keratin, conversion of keratin to digestible proteins, effect of fineness of grinding, chemical processing, and utilization of keratins as human food. 26 references. BV

749

Campos (MA) and Areas (JAG). **Protein nutritional value of extrusion-cooking defatted lung flour.** *Food Chemistry* 47(1); 1993; 61-66

Raw bovine lungs were dried, ethanol-defatted and extruded at diverse temp. and moisture contents of the feed including the optimum conditions for texture formation. Amino acid composition analysis and bioassay were carried out for the protein before and after every step of processing. The effect of extrusion on the nutritional quality of lung protein was highly dependent on the moisture content of the samples for processing. The high energy inputs required for proper processing at the low moisture level, 18%, can produce irreversible chemical modification of amino acids resulting in changes in their composition or bioavailability which is not detected by chemical analysis but only through biological assays. Defatting the dried lung with solvents of lower polarity, high lipid content lung flours can be produced to get good extrusion behaviour and processable at higher moisture. SD

750

Adegoke (GO) and Sagua (VY). **Influence of different spices on the microbial reduction and storability of laboratory-processed tomato ketchup and minced meat.** *Die Nahrung* 37(4); 1993; 352-355

Six non-commercial spices 1% (w/w) (*Xylopis acethiopica*, *Aframomum melegueta*, *Monodoran myristica*, *Piper guineense*, *Icacina* spp and *Congronema latifolia*) added to lab.-processed tomato ketchup and minced meat reduced spoilage microbial populations to different levels. Tomato ketchup spiced with *M. myristica* remained sterile after 24 h incubation at room temp. (26 plus or minus 2) whilst control samples had bacterial and yeast counts of 1.5×10^7 cfu/g and 2.0×10^5 propagules/g, respectively. *X. aethiopica* also reduced bacterial populations in tomato ketchup. In spiced minced meat, only *X. aethiopica* and *C. latifolia* showed an inhibitory effect on yeasts. Other spices used were not or relatively less effective against bacteria and yeasts. BV

Beef

751

Raharjo (S), Sofos (JN) and Schmidt (GR). **Effect of meat curing agents and phosphates**

on thiobarbituric acid (TBA) numbers of ground beef determined by the aqueous acid extraction TBA C_{18} method. *Food Chemistry* 47(2); 1993; 137-143

752

Ziauddin (KS), Mahendrakar (NS), Rao (DN) and Amla (BL). **Effect of freezing, thawing and frozen storage on physico-chemical and sensory characteristics of buffalo meat.** *Meat Science* 35(3); 1993; 331-340

A study was conducted on some physico-chemical and sensory characteristics of buffalo meat frozen by plate and blast freezing and stored at -15 plus or minus 3°C for a period of 3 months. A marginal increase in pH values and drip losses were observed during the storage period. Drip losses were less in blast frozen samples. WHC, cooking losses thermal shrinkage and WB shear values indicated inconsistent results, during storage. Similar observations were recorded with regard to tyrosine and TBA values. No significant differences in the physico-chemical characteristics were observed between meat cuts and minced meat. Plate frozen meat samples scored higher for texture, juiciness and aroma. Both the plate and blast frozen meat samples, however, were similar in overall quality according to taste panel results. AA

753

Lucia (LM), Vanderzant (C) and Acuff (GR). **Potential role of *Proteus-providencia-Morganella* species in quality deterioration of beef.** *Meat Science* 35(3); 1993; 321-330

754

Butler (AJ) and Larick (DK). **Effect of antioxidants on the sensory characteristics and storage stability of aseptically processed low-fat beef gels.** *Meat Science* 35(3); 1993; 355-369

755

Barkate (ML), Acuff (GR), Lucia (LM) and Hale (DS). **Hot water decontamination of beef carcasses for reduction of initial bacterial number.** *Meat Science* 35(3); 1993; 397-401

Mutton

Lamb

756

Hagyard (CJ), Keiller (AH), Cummings (TL) and Chrystall (BB). **Frozen storage conditions and rancid flavour development in lamb.** *Meat Science* 35(3); 1993; 305-312

Frozen storage of lamb at -5 or -10°C before ultimate storage at -35°C induced changes that led to rancidity development continuing at a more rapid rate at the lower temp. Parallel storage regimes, but with storage at -35°C first, then ultimate storage at -5 or -10°C, led to much less storage flavour development. No significant flavour changes occured even after 40 wk storage at -15°C followed by 20 wk storage at -35°C. SRA

Rabbit

757

Keshri (RC), Kumar (S) and Bachhil (VN). **Quality characteristics of barbecued rabbit cuts.** *Beverage and Food World* 21(1); 1994; 36-37

Fore- and hind quarters of 6 months old New Zealand white rabbits were processed into barbecue using two recipes and quality parameters were evaluated. The av. wt. of raw quarters was 132.50 gms. The wt. loss on refrigerated chilling averaged 0.98%. The mean values of cooking yield and meat bone ratio of quarters were 69.51% and 3.99 respectively. Hind quarters barbecued with recipe containing 10% vinegar (vol./wt.) had a significantly higher ($P < 0.05$) cooking yield. Sensory scores in general, were good to very good and flavour as well as overall acceptability scores were enhanced due to addition of vinegar. Microbiological examination of freshly prepared and of refrigerated product for 1 wk revealed absence of coliforms. The total plate counts were also below the objectionable level. A significant difference ($P < 0.01$) in composition of fore- and hind-quarters was observed for moisture, protein and ether extract whereas the total ash content did not differ significantly ($P < 0.05$). The mean values

for these were 56.66, 27.33, 7.27 and 3.64% respectively. AA

Products

Meat

Sausages

758

Berdague (JL), Monteil (P), Montel (MC) and Talon (R). **Effects of starter cultures on the formation of flavour compounds in dry sausage.** *Meat Science* 35(3); 1993; 275-287

The effect of 6 starter cultures of lactic acid bacteria (*Lactobacillus sake* L110, *Pediococcus acidilactici* 725, *P. pentosaceus* 716) and *Staphylococcus* species (*Staph. carnosus* 833, *Staph. warneri* 863, *Staph. saprophyticus* M31) strains were tested in 30 dry sausages without spices. Analysis of flavour compounds showed 80 volatile compounds of various origins (lipid oxidation, fermentations, amino acid catabolism) and animal feed stuffs. The sensory analyses showed that the butter odour of dry sausages largely depends on catabolism of carbohydrates and that curing and rancid odours were correlated with some typical compounds of lipid oxidation. SRA

759

Maijala (R) and Eerola (S). **Contaminant lactic acid bacteria of dry sausages produce histamine and tyramine.** *Meat Science* 35(3); 1993; 387-395

Forty-two lactic acid bacteria (LAB) strains were isolated from 7 dry sausages during 0, 21 and 49 days of ripening. Their ability to produce histamine and tyramine was studied by HPLC from broth cultures after 2 days. Histamine and tyramine concn. increased in the sausages during fermentation. 10 of the 42 LAB strains produced 402-1087 p.p.m. tyramine. 4 of these 10 LABS were also hystamine positive (725-1083). Most of the amine positive strains were found in sausages at the end of ripening and with highest amine levels. Study suggest that it could be possible to decrease the levels of amines formed by limiting the initial level and growth of these contaminant bacteria. SRA

Poultry

Chickens

760

Hwang (KT) and Maerker (G). **Determination of 6-ketocholestanol in unirradiated and irradiated chicken meats.** *Journal of the American Oil Chemist's Society* 70(8); 1993; 789-792

A method to detect 6-ketocholestanol in unirradiated and irradiated chicken meats was developed by means of chloroform-methanol-water extraction, adsorption chromatographic column separation and GC. This method is able to measure cholesterol oxidation products at levels that are much lower than those of previous methods. The new procedure was used to detect 6-ketocholestanol in fresh, unirradiated chicken and measured more than 97% of the test compound added to chicken below the p.p.m. level. Irradiation of the chicken meats to a dose of 10 kGy increased the concn. of this compound to about 4 times the level of unirradiated meats. AA

761

Sachdev (AK), Ram Gopal, Verma (SS), Kapoor (KN) and Kulshreshtha (SB). **Quality of chicken gizzard pickle during processing and storage.** *Journal of Food Science and Technology (India)* 31(1); 1994; 32-35

Vinegar-based chicken gizzard pickle stored at ambient condition and refrigeration were evaluated. Since microbial counts of red-chilli powder, turmeric, cumin, black pepper, caraway, aniseed, cinnamon and clove were high oven-drying of them before use is suggested. Changes in pH, shear force, moisture, crude protein, ether extract, thiobarbituric acid and total plate counts were faster during summer-rainy season. Product showed a shelf-life of 45 days in summer-rainy season and 75 days in water at ambient storage comparable in quality to refrigerated samples. SD

Broilers

762

Sawaya (WN), Abu-Ruwaida (AS), Baroon (ZH), Khalafawi (MS) and Murad (M). **Shelf-life of eviscerated broiler carcasses as affected by vacuum packaging and potassium sorbate.** *Lebensmittel-Wissenschaft und - Technologie* 26(6); 1993; 517-523

Packaging chicken Carcasses under vacuum and pretreating with potassium sorbate (VS), under vacuum without pretreating with potassium sorbate (V) or under air atm. after pretreating with potassium sorbate (CS), as compared with conventional packaging under air atm. (control) showed that the spoilage bacterial counts during storage at 4°C exceeded the upper limit of log 7.2 cfu/mL for the control by 25-26, 14-15 and 13-14 days after processing, and at 7°C by 16, 11 and 10-11 days respectively. These data indicated that a combination of vacuum packaging and sorbate dip can extend the shelf-life of poultry carcasses over those conventionally-packaged by an extra 18-19, 6-7 and 7-8 days at 4°C and 9, 4 and 3-4 days at 7°C, respectively. Under these conditions, the levels of *Enterobacteriaceae* were not affected substantially by either vacuum packaging of vacuum + potassium sorbate, although these levels were relatively lower than those reported using conventional packaging. The increased levels of total volatile nitrogen and decreased level of extract release vol. confirmed the positive relationship between these values and the bacterial counts of spoilage. The occurrence of certain selected spoilage bacteria, such as *Pseudomonas* and *Lactobacillus*, was substantially higher in air packaged carcasses (more at 7 then at 4°C) than in vacuum packaged ones, whereas *Lactobacillus* were predominant under vacuum conditions, independent of sorbate treatment. AA

Products

Eggs

763

Kroll (J), Rawel (H), Krock (R) and Schnaak (W). **Interaction of benzyl isothiocyanate with egg white proteins.** *Die Nahrung* 37(2); 1993; 179-181

SEAFOODS

764

Mabeau (S) and Fleurence (J). **Seaweed in food products: Biomedical and nutritional aspects.** *Trends in Food Science and Technology* 4(4); 1993; 103-107

Reviews briefly the biochemical, nutritional (polysaccharides and dietary fibres, minerals, vitamins, proteins and amino acids, lipids and fatty acids) and regulatory aspects associated with the use of seaweeds in food products. 19 references. BV

Fish

765

Hassan (F) and Sherief (PM). **Role and application of fish collagen.** *Seafood Export Journal* 251(4); 1994; 19, 21, 24

Collagen content of different types of fishes, its relation to meat texture, the application of collagen in leather industry, film industry and as medical aids in sutures, cargil membranes and surgical sponges are highlighted. GS

Cod

766

Shaltout (OE). **Chip-like cod based crackers: Acceptability and chemical composition.** *Lebensmittel-Wissenschaft und - Technologie* 26(6); 1993; 558-562

Fish chip-like crackers were prepared from wheat flour, mixtures of maize:wheat (1:1), potato:wheat (1:1) flour and meat of miced cod (*Gadus morhua*) at a flour to fish ratio of 90:10, 80:20 and 70:30. Sensory evaluation scores were highest for the following mixtures: 90% wheat flour-10% minced cod, 40% maize flour-40% wheat flour-20% minced cod, 45% potato flour-45% wheat flour-10% minced cod.

Chemical analysis showed significant increase in crude protein and ash contents, whereas, at the highest cod mince addition (20%), no significant increase in fat content was observed. An obvious improvement in the essential amino acid pattern of the highly accepted products was observed except for lysine and threonine being the most limiting as calculated by the chemical score. Nevertheless, at 20% addition of cod mince the lysine content of 40% maize flour-40% wheat flour formula greatly improved. The moisture content (6.38 - 7.42), a_w (0.32 - 0.52) and pH (5.9 - 6.1) of dried chip-like cod crackers predict a good shelf-life. AA

Mackerels

767
Srikar (LN), Khuntia (BK), Reddy (GVS) and Srinivasa (BR). **Influence of storage temperature on the quality of salted mackerel (*Rastrelliger kangurta*) and pink perch (*Nemipterus japonicus*).** *Journal of the Science of Food and Agriculture* 63(3); 1993; 319-322

Dry-salted mackerel and pink perch were stored at two temp.: ambient (26.8 plus or minus 3.3°C) and 2.5 plus or minus 1°C. Changes in moisture content, salt content, a_w, peroxide value (PV), free fatty acid (FFA) content, total volatile base nitrogen (TVBN) content, halophilic bacteria count and sensory scores for overall acceptability were studied. Loss of moisture and absorption of salt were considerably higher in the products stored at ambient temp. The decrease in a_w was more pronounced at ambient temp. than at the lower temp. Although the chemical indices of freshness (PV, FFA and TVBN) and the halophilic counts showed increasing trends, they were considerably lower in the products stored at the lower temp. Sensory evaluation for overall acceptability indicated that storage at the lower temp. could considerably extend the shelf-life of salted fish. AA

Sardines

768
Satish (MS), Hiremath (GG) and Dora (KC). **Non-solvent removal of fat from minced meat of oil sardine (*Sardinella longiceps*).** *Indian Journal of Nutrition and Dietetics* 28(4); 1991; 122-124

Minced meat of oil sardine was defatted by (i) simple water blanching, (ii) cooking, (iii) cooking followed by washing, (iv) treating with 1% sodium bicarbonate, and (v) 1% acetic acid followed by washing with cold and hot water (35 - 40°C). 90% of the fat of oil sardine meat could be removed by treatment (v), administered for 15 min. The greyish meat obtained showed acceptable quality. GS

Products

Fish

769
Udgata (SK) and Khuntia (BK). **Chitin and chitosan - the promising shell utilization.** *Seafood Export Journal* 25(14); 1994; 5, 7-8

The crustacean wastes contain about 10% chitin on dry wt. basis. Chitin and its derivative chitosan have several industrial applications like textiles, photography, medicine, agriculture, food processing, chromatography and animal feed. The methods of preparation of chitin and chitosan from this fishery waste are discussed. GS

PROTEIN FOODS

Infant foods

770
Allegri (G), Biasiolo (M), Costa (C), Bettero (A) and Bertazzo (A). **Content of non-protein tryptophan in human milk, bovine milk and milk-and soy-base formulas.** *Food Chemistry* 47(1); 1993; 23-27

Colostrum contains much more of both the forms of non-protein tryptophan (NPT) than mature human milk (HM) and bovine milk (BM) and free tryptophan (%) also is higher in HM. NPT in fresh commercial BM is similar to those of BM 1 month after delivery. Both forms of NPT also are much higher in soybean than BM

formulas but the values are significantly lower than in colostrum. SD

771

Almeida-Dominguez (HD), Serna-Saldivar (SO), Gomez (MH) and Rooney (LW). **Production and nutritional value of weaning foods from mixtures of pearl millet and cowpeas.** *Cereal Chemistry* 70(1); 1993; 14-18

Weaning foods (WF) were produced by mixing decorticated and press-dried pearl millet (70%) and cowpea (30%) with and without sorghum malt (SM). Decorticated millet and cowpea flours were cooked into a slurry and press-dried to produce flakes. The heat applied during cooking of the slurry and press-drying was designed to develop proper paste properties for the preparation of porridge like WF. SM hydrolyzed the starch and produced a beverage that contained 17% protein with 90% of the essential amino acids required for infants < 1 yr old. AA

772

Paul (SC) and Mathur (BN). **Development of a low lactose infant formula. Part IV. Storage related changes in the chemical characteristics.** *Indian Journal of Dairy Science* 46(8); 1993; 377-380

Investigation was carried out for the assessment of storage related chemical changes taking place in a low lactose infant formula (LIF) having 20, 35, 50% of lactose hydrolysis of total lactose. No chemical changes were observed in the LIF samples under double nitrogen gas packing during storage at 37°C for period of 1 yr. The level of PM in LIF remained constant (6.30) irrespective of the level of hydrolysis. The changes in hydroxy-methyl furfural content and available lysine content were relatively higher in LIF sample within 50% level of lactose hydrolyses. The shelf-life at 37°C is estimated to be 6, 5 and 4 months for LIF 20, LIF 35, LIF 50 respectively. SRA

773

Paul (SC) and Mathur (BN). **Development of a low lactose infant formula (LIF). Part V. Nutritional characteristics (LIF) in relation to protein-carbohydrate interaction.** *Indian Journal of Dairy Science* 46(8); 1993; 381-386

This investigation was directed at the characterization of protein-carbohydrate interaction in a spray-dried low-lactose infant formula (LIF) in relation to the degree of lactose hydrolysis. The effect of such interaction on the nutritional parameters of the lactose hydrolyzed spray-dried product was also evaluated. Gel chromatography was employed to isolate the protein carbohydrate interaction products formed during processing. The fractions of whey protein involved with interaction with carbohydrates in descending order were found to be serum albumin, β-lactoglobulin and α-lactalbumin B. With the progress in the degree of lactose hydrolysis in the LIF a loss was observed in PER, NPU and available lysine content being 2.96, 81.34 and 0.77% for LIF-20; 2.80, 7.17 and 0.73% for LIF-35; and 2.66, 67.63 and 0.68% for LIF-50, respectively. Irrespective of the extent of lactose hydrolysed, the lysine content of LIF samples decreased steadily with the progress in the storage period indicating a progressive loss in the nutritional adequacy of the product. Availability of lysine in the stored sample seemed to be the limiting factor in the detn. of the shelf-life of the prepared formula. AA

ALCOHOLIC AND NON-ALCOHOLIC BEVERAGES

Alcoholic beverages

Beers

774

Pearce (TC), Gardner (JW), Friel (S), Bartlett (PN) and Blair (N). **Electronic nose for monitoring the flavour of beers.** *Analyst (London)* 118(4); 1993; 371-377

An electronic instrument is described that has been designed to measure the odour of beer and supplement or even replace existing analytical methods. The instrument consists of an array of up to 12 conducting polymers, each of which has an electrical resistance that has partial sensitivity to the headspace of beer. The signals from the sensor array are then

conditioned by suitable interface circuitry and processed using a chemometric or neural classifier. The results of the application of multivariate statistical techniques are given. The instrument, or electronic nose is capable of discriminating between various commercial beers and, more significantly, between standard and artifically-tainted beer. An industrial version of this instrument is now undergoing trials in a brewery. BV

Wines

775

Garcia-Jares (C) and Medina (B). **Research on white and red wine blending in the production of rose wines by means of the partial least squares method.** *Journal of the Science of Food and Agriculture* 63(3); 1993; 349-354

The difficult problem of recognizing wine blends in rose wines is assessed using a powerful statistical method called partial least squares. Genuine rose wines are first detected using a 280 nm/320 nm spectrophotometric ratio. Blends of white and red wine are used as a calibration set and for an evaluation set of known composition. The proposed method evaluates the respective percentage of red and white wine in a blend and the error associated with the prediction. A comparison is made with principle component regression. AA

Non-alcoholic beverages

Coffee

776

Rogers (PJ) and Richardson (NJ). **Why do we like drinks that contain caffeine ?.** *Trends in Food Science and Technology* 4(4); 1993; 108-111

Analyses the mechanisms underlying the choice, consumption and liking for caffeine - containing drinks; psychoactive effects of caffeine on the mood, performance and behaviour; and side effects of caffeine withdrawal such as lethargy, irritability, depression and headache. GS

777

Boccas (F), Roussos (S), Gutierrez (M), Serrano (L) and Viniegra (GG). **Production of pectinase from coffee pulp in solid state fermentation system: Selection of wild fungal isolate of high potency by a simple three-step screening technique.** *Journal of Food Science and Technology (India)* 31(1); 1994; 22-26

248 cultures isolated from Mexico's coffee growing areas were screened and potent cultures selected. *Aspergillus niger* CH_4 a pectolytic strain was the reference. First, pectolytic activities of 248 fungal strains on a selective solid agar medium were evaluated; next the pectolytic activities of the 13 selected isolates quantified in a submerged fermentation medium with pectin as the sole carbon source and finally the 4 selected fungal isolates assayed for their capacity to produce pectinase from coffee pulp by solid state fermentation. *Asp. niger* V22 B35, a wild strain, produced 4 times more pectinase than the reference. SD

Fruit juices

Apple juices

778

Poll (L). **The effect of pulp holding time and pectolytic enzyme treatment on the acid content in apple juice.** *Food Chemistry* 47(1); 1993; 73-75

It is shown that malic acid was enzymatically reduced during the period from pulp production until pressing of the juice (pulp holding time). After 8 and 24 h pulp holding time the malate content was reduced by 50% (70% of the original content). Corresponding figures for titratable acid were 62% and 81%. Pectolytic enzyme treatment resulted in higher malate and titratable acid content than the control due to pectin esterase activity of the added enzymes and probably due to better extraction of the malate from the pulp. AA

Guava juices

779

Khurdiya (DS) and Srivastava (S). **Effect of enzymes, lye peeling and condition of fruits on the quality of guava juice.** *Indian Food Packer* 48(2); 1994; 5-10

Enzymes, lyepeeling and condition of guava fruits greatly influenced the pectin, tannins, ascorbic acid and yellow index of the liquefied juice. The pectin content of the juice was in the range of 0.062 to 0.704%. The juice from unpeeled, more green than yellow guava possessed higher pectin (16.71%) and tannins (7.03%) in comparison with that of yellow with green tinge fruit. The ascorbic acid content of juice was in the range of 53.66 to 98.39 mg/100 ml. Lye peeling caused reduction in pectin (25%), tannins (22-25%), ascorbic acid (25-30%) and yellow index (7-16%) of the liquefied juice. The juice and nectar prepared from lye peeled yellow with green tinge fruit obtained highest colour (7.21 and 7.77) and flavour (7.21 and 7.18) scores respectively. GS

Oranges juices

780

Bankole (SA). **Fungi associated with post-harvest rot of sweet orange (*Citrus synensis*) and aflatoxin B_1 production by isolates of *Aspergillus flavus* on plain and supplemented orange juice.** *Die Nahrung* 37(4); 1993; 380-385

Samples of rotting sweet orange (*Citrus sinensis*) were obtained from the depots, sales counters and waste baskets. Fungi, associated with rotting fruits were isolated and identified. Out of 12 species of fungi isolated, 8 are known to be producers of toxins. The 7 isolates of *Asp. flavus* obtained were screened for aflatoxin production in a nutrient sol., and 4 were found to be aflatoxigenic, producing primarily aflatoxin B_1. Aflatoxin B_1 production of the toxigenic isolates were further studied on plain juice and juice separately supplemented with 2.0% yeast extract and 2.0% sucrose. The highest yield of aflatoxin B_1 was produced on juice supplemented with yeast extract by the 4 toxigenic *Asp. flavus* isolates, followed by sucrose supplementation while the lowest amount of aflatoxin B_1 was detected on plain juice. Optimum temp. for aflatoxin B_1 production by *Asp. flavus* isolate (IBA-O1) was 25°C to 30°C, for an incubation period of 7-11 days on plain and supplemented juce media. AA

Watermelon juices

781

Saini (SPS) and Bains (GS). **A new method for mechanized production of watermelon seeds and juice.** *Indian Food Packer* 48(2); 1994; 55-57

A new process for the mechanized extraction of seed and juice simultaneously was experimented with watermelons samples of 200 kg of each cv. i.e. H 23 and Shipper. A method for the production of vitaminized watermelon juice was also introduced. Fresh juice was low in TSS (8.4 and 8.6°Brix), poor in acidity (0.05 and 0.08%) and high pH. Both the var. were poor in ascorbic acid. Their vitamin C content was improved by ascorbic acid fortifications before bottling. Bottled juice stored well over a period of 26 wk under ambient (12-40°C) conditions. Mechanical extraction being more economical gave higher seed yield than the traditional manual extraction process. GS

Sugarcane juices

782

Sivasubramanian (CC) and Pai (JS). **Effect of heat treatments on the quality of sugarcane juice.** *Indian Food Packer* 48(2); 1994; 51-54

Sugarcanes of var. co 419 were blanched (i) with peel, (ii) with partial peeling and (iii) after complete peeling. Blanching treatment with partial peeling of the sugarcanes for 15 min in steam gave an acceptable colour for the juice. HTST pasteurization brought about max. flavour retention. Degradation products of sugar during storage increased the off-flavour with unacceptable colour with the juice. GS

Tea

783
Tomas (C), Celeste (M), Cladera (A), Gomez (E), Estela (JM), Cerda (V). **A new flow-injection spectrophotometric method for the determination of tannins in tea and beer using iron (III) and 1,10-phenanthroline.** *Food Chemistry* 47(2); 1993; 201-204

Automatic sample injection, data acquistion and processing was controlled by a personal computer with the FIA set-up. The calibration curve between 0-30 mg/litre gallic acid was linear and the relative standard deviation for a standard containing 10 mg/litre gallic acid was 0.7% (n=10). The sample throughput of 60 sample/h was achieved. In this method, no pretreatment of sample to avoid interferences was required but only appropriate sample dilation and so more reliable results in substantially shorter period were obtained. SD

FATS AND OILS

Oils

784
Marangoni (AG), McCurdy (RD) and Brown (ED). **Enzymatic interesterification of triolein with tripalmitin in canola lecithin-hexane reverse micelles.** *Journal of the American Oil Chemist's Society* 70(8); 1993; 737-744

785
Frankel (EN). **Formation of headspace volatiles by thermal decomposition of oxidized fish oils vs oxidized vegetable oils.** *Journal of the American Oil Chemist's Society* 70(8); 1993; 767-772

To understand the reasons for differences in oxidative stability among edible oils, the temp. dependence was investigated for the development of volatile lipid oxidation products in fish oils and in vegetable oils. A rapid headspace capillary GC method was developed to determine volatile oxidation products of ω-6 (n-6) polyunsaturated fats (pentone and hexanal) and ω-3(n-3) polyunsatur fats (propanal) at different decomposition temp. Headspace GC analyses of partially oxidized menhaden, bonita and sardine oils could be performed at 40°C, whereas soybean, canola, safflower, high-oleic sunflower and high-oleic safflower oils required temp. > 100°C. Volatile formation by thermal decomposition of oxidized oils had lower apparent activation energies in fish oils than in vegetables oils, and significantly higher apparent activation energies in high-oleic oils than in polyunsaturated oils. The activation energy data on headspace volatiles provided another dimension toward a better understanding of the thermal stability of flavour precursors in unsaturated fish and vegetable oils. AA

786
Iskander (FY). **Determination of seventeen elements in edible oils and margarine by instrumental neutron activation analysis.** *Journal of the American Oil Chemist's Society* 70(8); 1993; 803-805

Instrumental neutron activation analysis was used to determine the concn. of As, Ba, Ce, Co, Cr, Cs, Eu, Fe, Hg, K, Na, Rb, Sb, Se, Sr and Zn in almond, sunflower, peanut, sesame, linseed, soy, corn and olive oils, as well as in 3 margarine brands. The concn. of As, Ba, Ce, Cs, Eu, Hg, Rb, Se and Sr were below the system detection limit under the exp. conditions. Cr was detected only in one of the margarine samples (171 μg/g); Sb only in corn oil (18 ng/g) and Sc only in linseed oil (19 ng/g). Co, Fe, K, Na and Zn were detected in all oil and margarine samples investigated. The concn. ranges for Co, Fe, K, Na and Zn in oils were: 0.016-0.053; 4.45-19.1; 5.93-47.2; 2.44-12.9 and 0.48-1.54 μg/g, respectively. For margarine, the concn. ranges for Co, Fe, K, Na and Zn were 0.09-0.012; 4.53-10.6; 58.3-1140; 13.2-9870 and 0.38-0.47 μg/g, respectively. The elemental contents of the analyzed samples are within the ranges reported in the literature for edible oils and fats. AA

Avocado oils

787
Bizimana (V), Breene (WM) and Csallany (AS). **Avocade oil extraction with appropriate technology for developing countries.** *Journal*

of the American Oil Chemist's Society 70(8); 1993; 821-822

Extraction of oil from avocado fruit mesocarp tissue were compared and modified for the purpose of creating applicability in developing countries. Highest recoveries were obtained at a 5:1 water-to-avocado ratio, pH 5.5 and centrifugal force of 12,300 X g. Addition of 5% $CaCO_3$ or $CaSO_4$ allowed extraction without organic solvents. The relationship was linear between heating temp. (75-98°C) and the time for oil release from slurries. Gravity settling for 4 days at 37°C followed by centrifugation improved oil yield. Optimal oil recoveries were 70-80%. AA

Canola oils

788

Adu-Peasah (SP), Diosady (LL) and Rubin (LJ). **A multistage hydrocyclone/stirred-tank system for countercurrent extraction of canola oil.** *Journal of the American Oil Chemist's Society* 70(8); 1993; 755-762

Ground canola seed containing 46.9% oil (A) and partially extracted meal, similar to pre-pressed meal containing 13.7% oil (B), were ground in a methanol/ammonia/water sol., filtered to remove antinutrients and extracted countercurrently with hexane in a multistage hydrocyclones/stirred-tank extraction unit. An empirical model was developed for predicting the yield (i.e., oil recovery) from the process. Based on the model calculations, a 6-stage unit operating at a hexane-to-meal ratio (R) of 6.2 L/kg was required for processing meal A. The calculated oil recovery was 98.3%, resulting in a meal containing 0.7% residual oil. Meal B required a 5-stage unit operating at R = 5.7 L/kg. The calculated oil recovery was 99.2% with 0.6% residual oil in the meal. The calculations were confirmed experimentally with two- and four-stage crosscurrent extraction processes. AA

Citrus seed oils

789

Ajewole (K) and Adeyeye (A). **Characterisation of Nigerian citrus seed oils.** *Food Chemistry* 47(1); 1993; 77-78

The oil content of the 6 citrus seed oils from Nigeria viz *Citrus sinensis*, *C. paradisi*, *C. aurantium*, *C. reticulata*, *C. aurantifolia* and tanglo (a hybrid between *C. paradisi* and *C. reticulata*) ranged from 24 to 41%; major fatty acids (palmitic) from 12.1 to 28%, oleic from 26.1 to 45.3% and linoleic from 29 to 38%. Stearic and linolenic were the other fatty acids. The uinsaturation of the oils ranged to high degree from 67.3 to 86.2%. The physico-chemical properties and fatty acid compositions compared well with good quality vegetable oils. Their high degrees of unsaturation reduce the probability of aiding heart diseases. Consequently, refining could provide a useful component for edible oil formulation. SD

Palm oils

790

Hariharan (K) and Raina (PL). **Influence of long term feeding of palm oil on the lipid composition of perirenal adipose tissue in rats.** *Die Nahrung* 37(4); 1993; 374-379

The composition of perirenal adipose tissue in Wistar strain of rats fed palm oil (PO) fat at 5% and 20% in diet for a period of 18 wks was studied. Peanut oil (PNO) at 5% and 20% were used as controls. Under the experimental conditions, the saturation index was higher in animals fed diet containing PO compared to those fed PNO. There was no significant difference with reference to 12:0, 14:0 and 18:1 fatty acid levels, whereas linoleic acid (18:2) showed a proportional relationship between the intake and perirenal adipose tissue levels. There was a significant correlation of dietary intake of linoleic acid and the U/S ratio in the adipose tissue. Linoleic acid (18:2, n6) levels were increased in 20% PNO groups as compared to those fed PO. However, palmitoleic acid (16:1) did not show a proportional relationship between the intake and adipose tissue levels. Thus, the study shows that more saturated fatty acids are incorporated in the PO groups than in the PNO groups at the end of 18 wks feeding. AA

791

Mohankumar (C), Arumughan (C) and Kaleysa Raj (R). **Histochemical changes in mesocarp of oil palm (*Elaeis guineensis*) fruit during development.** *Journal of Food Science and Technology (India)* 31(1); 1994; 19-21

Immature mesocarp cells of oil palm fruit (12 wks after anthesis) were thin-walled and oval-shaped with intercellular spaces, while mature mesocarp contained densely packed thick-walled polygonal cells, filled with numerous oil bodies (oleosomes), 24 wks after anthesis. Unlike oilseeds, the oil palm fruit mesocarp contains fat and fibres as the major storage and structural components. Structural components increased slowly during the early stages of fruit development (4 to 16 wks), followed by a steep increase in the mature stages (20 to 24 wks). similarly, the lipid content in the fresh mesocarp increased steeply from 7% at 16th wk to 48% by 24th wk after anthesis. Proteins and sugar, though minor constitutents, also showed a progressive increase. AA

792

Desai (BJ) and Dubash (PJ). **Recovery of carotenes from crude palm oil by adsorption method.** *Journal of Food Science and Technology (India)* 31(1); 1994; 60-61

Acid-treated bentonite and alumina gel mixture, as adsorbents in varying ratios, recovered significant amounts of carotenoids from crude palm oil, without affecting its quality. As the clay level increased, the amount of residual carotenoids in the palm oil decreased. The max. adsorption of 79% carotenoids was possible at 4:1 ratio of bentonite and alumina gel. AA

Rice bran oils

793

Gopala Krishna (AG). **Isolation and identification of the causative factors responsible for colour fixation in rice bran oil.** *Journal of the American Oil Chemist's Society* 70(8); 1993; 785-788

Crude and dewaxed rice bran oil of 6.8% free fatty acids were fractionated on a slica gel column to get a dark-coloured material (0.57% of the oil). TLC analysis of the material showed a spot corresponding to monoglycerides, but there were no spots corresponding to other glycerides. Traces of P (< 0.1 p.p.m.), Fe (1.3 p.p.m.) and 12% non-saponifiable matter was also observed. Palmitic, oleic and linoleic acids were identified after GC analysis. GS

SPICES AND CONDIMENTS

Spices

794

Kaul (M) and Taneja (N). **Microbial load of common Indian spices.** *Indian Journal of Nutrition and Dietetics* 27(8); 1990; 237-242

Five to six samples of omum (Ajowan), asafoetida (Hing), fenugreek (Methi), big cardamom (Badi elaichi), small cardamom (Chhoti elaichi), cinnamon (Dalchini) and cloves (Lavang) were heated at different temp. for varying periods of time to see the effect of dry heat on their aerobic count. The total count ranged between 10^7 CFU/g in fenugreek and cloves to 10^2 CFU/g in asafoetida and big cardamom. The total gram negative count ranged from 0 in cloves, big and small cardamoms to 10^7 CFU/g in asafoetida. The counts varied between spices as well as between samples of the same spice. The bacterial spore count constituted 50 to 90% of the total aerobic count being max. in fenugreek and asafoetida (10^5 CFU/g). Heating of spices for 1 h at 120°C reduced the microbial load considerably. GS

795

Meena (MR) and Sethi (V). **Antimicrobial activity of essential oils from spices.** *Journal of Food Science and Technology (India)* 31(1); 1994; 68-70

Essential oils from spices viz. ginger, cumin, ajowan, coriander, basil, clove and mustard as well as eugenol showed various degrees of inhibition against *Aspergillus niger*, *Saccharomyces cerevisiae*, *Mycoderma* sp.,

Lactobacillus acidophilus and *Bacillus cereus*, as determined by paper disc agar diffusion method. *Mycoderma* sp. was the most susceptible, while *B. cereus* was most resistant towards all the spice essential oils. Greater antimicrobial activity was observed in allyl-iso-thiocyanate (volatile oil of mustard), followed by oil of ajowan and eugenol, both at ambient temp. and 37°C. The oils from other spices were less effective. AA

Chillies

796

Lownds (NK), Banaras (M) and Bosland (PW). **Relationships between postharvest water loss and physical properties of pepper fruit (*Capsicum annum* L.).** *Hortscience* 28(12); 1993; 1182-1184

'Keystone' 'Nu Mex Naky' and 'Santa Fe Grande' peppers, differing in physical characteristics were stored at 8, 14 or 20°C. Water-loss rate (WLR) increased linearly with storage time at each temp. and was different for each cv. WLR was positively correlated with initial water content at 14 and 20°C, surface area (SA):val. ratio at all temp. and cuticle thickness at 14 and 20°C. WLR was negatively correlated with SA and epicuticular wax content at all temp. Stomata were absent on the fruit surface, and epicuticular wax was amorphous for each cv. SRA

Coriander

797

Pino (J), Borges (P) and Roncal (E). **Compositional differences of coriander fruit oils from various origins.** *Die Nahrung* 37(2); 1993; 119-122

The composition of the volatile oil of coriander fruit of different geographical origins was investigated by means of GLC, column chromatography and coupled GC-MS. The 18 most important components were identified and quantified. BV

Cumin

798

Borges (P) and Pino (J). **The isolation of volatile oil from cumin seeds by steam distillation.** *Die Nahrung* 37(2); 1993; 123-126

The isolation of the essential oil of cumin seeds by steam distillation is described. The chemcial composition of the oil is investigated by means of chromatographic-spectrometric methods and physico-chemical indices. The 17 most important components are identified and quantified. AA

Pepper

799

Borges (P) and Pino (J). **Preparation of black pepper oleoresin by alcohol extraction.** *Die Nahrung* 37(2); 1993; 127-130

Black pepper oleoresin was prepared by alcohol extraction. Product characteristics and yields obtained by maceration and SOXHLET extraction were compared. The most attractive process was maceration and its influence on volatile oil composition was also evaluated by capillary GLC. AA

Condiments

Chutneys

800

Chauhan (SK), Lal (BB) and Sharma (R). **Development of instant dehydrated wild pomegranate chutney.** *Journal of Food Science and Technology (India)* 31(1); 1994; 58-59

Five combinations (T_1, T_2, T_3, T_4 and T_5) of wild pomegranate (WP) chutney was prepared. T_1 - T_5 contained 250 g WP, 5 g coriander leaves and 10 g mint leaves and sodium benzoate. Green chillies were used at 5, 10, 15, 15 and 20 g in T_1 - T_5 respectively. Sugar in 10 g and 15 g quantities was added only in T_4 and T_5 respectively. T_3 contained good amounts of vitamin C, sugar, ash and fibre. The product reconstituted well in cold water, possessed all characteristics of fresh chutney and had a shelf-life of more than 6 months. BV

Essential oils

801

Gundidza (M), Deans (SG), Kennedy (AI), Mavi (S), Waterman (PG), Gray (AI). **The essential oil from *Heteropyxis natalensis* Harr: Its antimicrobial activities and phytoconstituents.** *Journal of the Science of Food and Agriculture* 63(3); 1993; 361-364

The essential oil (EO) of *H. natalensis* (the lavender tree) obtained by steam distillation was tested for antimicrobial properties. The EO exhibited considerable inhibitory activities against food poisoning bacteria and mycotoxigenic fungi. GC-MS analysis indicated the EO contained 1,8-cineole, limonene, β-myrcene, α-phellandrene and α-pinene. BV

SENSORY EVALUATION

Nil

FOOD STORAGE

802

Lal (S), Lal (J), Arora (KK), Shiv Shankar and Kumar (V). **Development of suitable sealing mechanism for fumigation covers in commercial godown in India.** *Bulletin of Grain Technology* 31(1); 1993; 3-5

New technology of sealing mechanism for fumigation covers in fumigation of foodgrain in commercial warehouses is described. The sealing mechanism consists of LDPE channel to be embeded on the godown floor surrounding the area of stack. The rubber pipe is to be fixed in the channel for sandwiching the fumigation covers after fumigating the stack. This technology was compared with existing operational technique of sealing fumigation covers. The new system of sealing mechanism was found completely air tight, more scientific, effective, less expensive and less laborious as compared to the present operational technique. Thus, the applicability of the system for commercial godowns stands established from technical and operational points. Only traces of gas leakage (within allowable limits) due to improper arrangement of the cover and fixing of rubber pipe were observed. AA

803

Chaudhary (SD), Gupta (DS) and Chaudhary (OP). **Popularity and efficiency of storage structures in rural Haryana.** *Bulletin of Grain Technology* 31(1); 1993; 26-31

Samples of grains from rural storage structures from Haryana, India, were collected in 3 seasons. Infestation, being found in all the storage structures, was max. in kothies (24.3%) followed by heaps in living rooms (21.6%), bags kept without Bhusa (18.3%), separate store rooms (17.7%), Bhukhari (16.8%) and metal bins (10.8%). Among smaller storage structures max. infestation was in Harra (82.8%) followed by Padkhala (28.0%), Parchhattis (2.2%) and wooden boxes (7.2%). Bags kept in Bhusa, although were not commonly used, showed very little infestation (0.3%). GS

INFESTATION CONTROL AND PESTICIDES

804

Velumani (SA), Thirupathi (TV), Planiswamy (PT) and Mohan (TS). **Process development for defatted neem kernel powder (DFNKP) preparation for the pest control.** *Bulletin of Grain Technology* 31(1); 1993; 6-9

A process for extracting max. active principle in neem Azadirachtin is described. The DFNKP so extracted is used at the rate of 0.05, 0.2, 0.25, 0.5 and 1% concn. (wt./wt) for the control of pulse beetle, rice weevil and paddy lesser grain borer. DFNKP controlled the pests better than raw neem kernel powder and was most effective at a concn. of 1 g/kg of seed. GS

805

Sharma (DL) and Kaur (P). **Effect of infra-red radiations on rust red flour beetle *Tribolium castaneum* (HERBST) - a pest of stored grains.** *Bulletin of Grain Technology* 31(1); 1993; 10-12

Samples of stored grains containing *Tr. castaneum* and infested grains were exposed to infra-red radiation from a distance of 20 cms for 5, 10 and 20 min. The mortality of insects was found to be 58, 87 and 100% respectively. The distance between the sample and radiation point was increased to 40 cm and samples were exposed to 20, 30 and 40 min. The mortality of insects was 25, 77 and 100% mortality of *Tr. castaneum* was achieved in samples exposed to radiation at 40 cm distance for 40 min and can be used for controlling stored grain insects. BV

806

Singh (VN), Pandey (ND) and Singh (YP). **Efficacy of vegetable oils for the control of *Callosobruchus chinensis* Linn. infesting gram and their subsequent effect on germination.** *Bulletin of Grain Technology* 31(1); 1993; 13-16

Twelve vegetable oils, viz., sesamum (*Sesamum indicum* L.), sunflower (*Helianthus annuus* L.), soybean (*Glycine max L. Merr*), linseed (*Linum usitatissimum L.*), mustard (*Brassica juncea L.*), safflower (*Carthamus tinctoria L.*) karad (*Raphanus sativus L.*), castor (*Ricinus communis L.*), coconut (*Cocos nucifera L.*), groundnut (*Arachis hypogaea L.*), rice bran (*Oryza sativa L.*) and taramira (*Eruca sativa L.*) were evaluated as grain protectant at 1 ml and 3 ml/kg seed of gram against infestation caused by *C. chinensis Linn.* The least reduction in grain wt. by the grubs was recorded in seeds treated with the oil of castor, soybean, taramira, mustard, coconut, groundnut, safflower, rice bran and sunflower at 1 ml/kg seed, whereas there was no damage at all in seeds treated with the oil of castor, soybean, mustard and taramira at 3 ml/kg seed. All treatments were found superior to control. Almost similar trend was also observed in damaged grain of gram seeds treated with 2 dosages of oils at 1 ml and 3 ml/kg seed. AA

807

Monro (JA). **A nutritionally valid procedure for measuring soluble dietary fibre.** *Food Chemistry* 47(2); 1993; 187-193

Being different from the current methods, soluble fibre is extracted before and separately from starch digestion and use sequential gastric and intestinal media. The method extracted less fibre, was sensitive to the effects of cooking, comparable in degree of fibre extraction to *in-vivo* conditions (in the rat model) and was highly sensitive to pH. SD

BIOCHEMISTRY AND NUTRITION

808

Randhawa (RK) and Kawatra (BL). **Effect of dietary protein on the absorption and retention of Zn, Fe, Cu, and Mn in pre-adolescent girls.** *Die Nahrung* 37(4); 1993; 399-407

Three experimental diets, viz. habitually consumed diet (D1), D1 + 34 g pulses (D2), D1 + 190 ml milk (D3) were fed to 18 healthy pre-adolescent girls of low-socio-economic group. The additional amount of pulses/milk provided 8 g of additional protein/day. The overall results indicate that the supplementation of habitually consumed diet with a small amount of milk greatly improved the absorption and retention of trace minerals. Min. daily intake of Zn, Cu and Mn required to maintain equilibrium of these minerals in pre-adolescent children was calculated using the prediction equations and was found to be 8.77, 2.01 and 1.91 mg, respectively. The requirement of Fe could not be calculated due to wide variations among the subjects. AA

TOXICOLOGY

Nil

FOOD LAWS AND REGULATIONS

Nil

CENTRAL FOOD TECHNOLOGICAL RESEARCH INSTITUTE, MYSORE - 570 013

(MANPOWER DEVELOPMENT TRAINING SCHEDULE FOR 1994-95)

03 AUG 94 to 19 AUG 94	**FUMIGATION, PEST CONTROL & PROPHYLACTIC TREATMENTS**	CFTRI, Mysore
22 AUG 94 to 02 SEP 94	**BASICS OF FLOUR MILLING**	Flour Milling Technologist Assn.
05 SEP 94 to 16 SEP 94	**TECHNIQUES IN SOLID STATE FERMENTATION**	CFTRI, Mysore
19 SEP 94 to 23 SEP 94	**WORKSHOP ON BAKERY SCI. & TECH. FOR MFIL**	US Wheat Associates, New Delhi
26 SEP 94 to 13 OCT 94	**POST HARVEST TECH. OF FRUITS & VEGETABLES**	CFTRI, Mysore
17 OCT 94 to 21 OCT 94	**TRANSPORT PACKAGING FOR FOOD PRODUCTS**	CFTRI, Mysore
24 OCT 94 to 28 OCT 94	**RODENT CONTROL**	CFTRI, Mysore
14 NOV 94 to 02 DEC 94	**TECHNOLOGY OF FRUIT & VEGETABLE PRODUCTS**	CFTRI, Mysore
05 DEC 94 to 16 DEC 94	**HEAVY METAL CONTAMINANTS**	ICMR, New Delhi
19 DEC 94 to 30 DEC 94	**CONVENIENCE FOODS ON MEAT AND POULTRY**	Min. Fd. Processing, Govt of India
02 JAN 95 to 13 JAN 95	**TECH. ON STORAGE, PROCESSING & QC OF FD GRAINS**	FCI, New Delhi
16 JAN 95 to 27 JAN 95	**ALCOHOLIC BEVERAGES & QC INCLUDING ALCOHOLIMETRY**	Excise Dept., Karnataka Govt.
30 JAN 95 to 03 FEB 95	**MILLING AND PARBOILING OF RICE**	CFTRI, Mysore
06 FEB 95 to 17 FEB 95	**BAKING SCIENCE AND TECHNOLOGY**	US Wheat Associates, New Delhi
20 FEB 95 to 03 MAR 95	**AFLATOXIN ANALYSIS IN FOODS AND FEEDS**	CFTRI, Mysore
06 MAR 95 to 10 MAR 95	**COCOA PRODUCTION, PROCESSING AND PRODUCTS**	CFTRI Mysore & CPCRI Karaikudi
13 MAR 95 to 24 MAR 95	**FOOD ANALYSIS & QUALITY CONTROL UNDER THE FOOD LAWS**	CFTRI, Mysore

For details please write to:

THE HEAD

MPD, CFTRI,

MYSORE - 570 013

AUTHOR INDEX

Regd. No. 36729/84

Printed and published by Director, Central Food Technological Research Institute, Mysore 570 013, at CFTRI Printing Press. Editor: Shri K. A. Ranganath, CFTRI, Mysore.